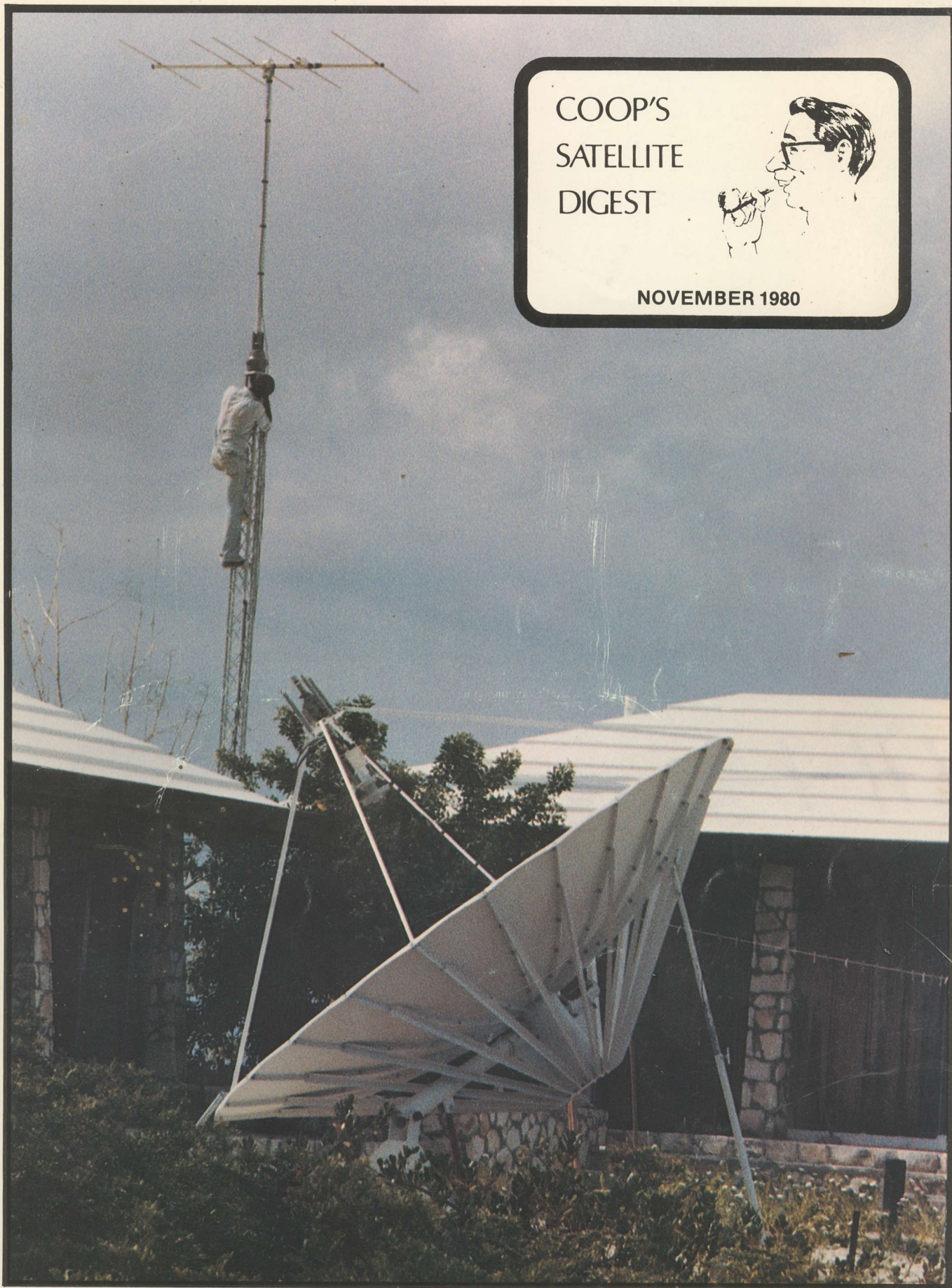


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COOP'S
SATELLITE
DIGEST



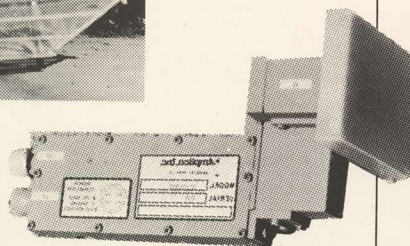
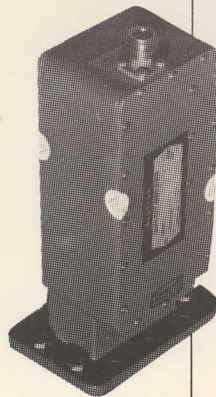
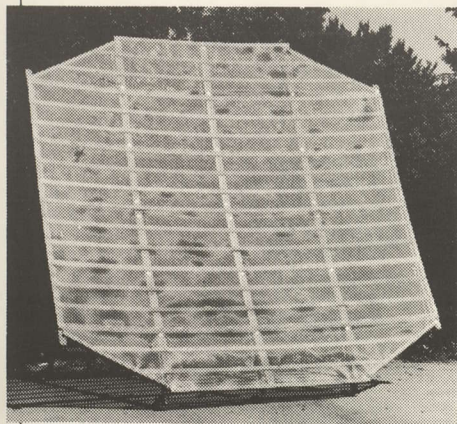
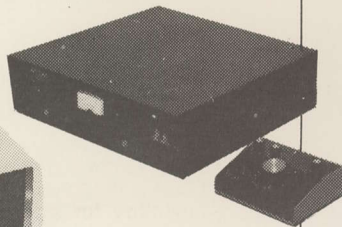
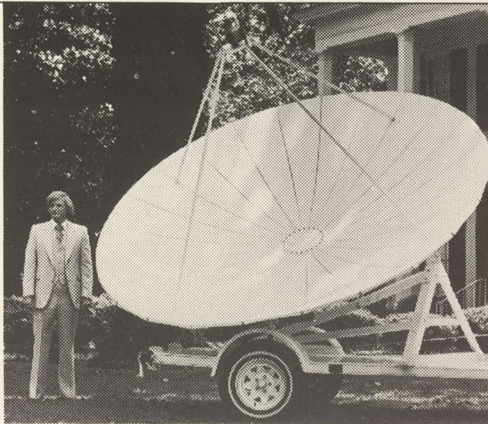
NOVEMBER 1980



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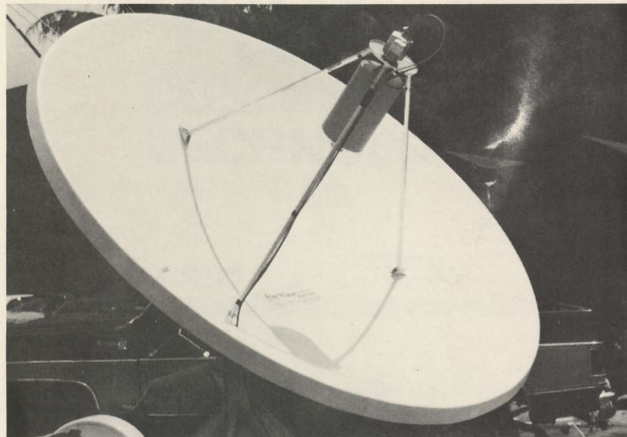


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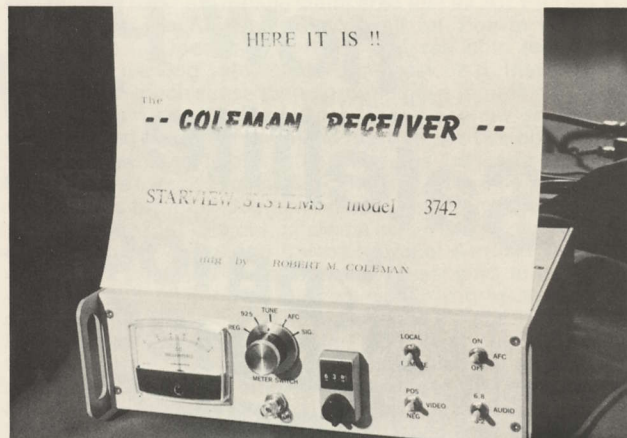
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Starview Systems has teamed up with Robert Coleman to introduce the ultimate low-cost complete system. Shown first at SPTS San Jose, the full TVRO receiver (including LNA portion) mounts at the dish! Our 10R system has a complete 10 foot dish antenna, plus a remotely tuned receiver that is housed at the dish feedpoint. Just bring down the low-cost RG-59/U to your TV receivers. Here is a **complete** system that delivers NTSC re-modulated satellite signals on VHF channels 3 or 4. The price? A real breakthrough at \$4650! Find out more today.



NEW!!! Coleman 3742 Receiver!

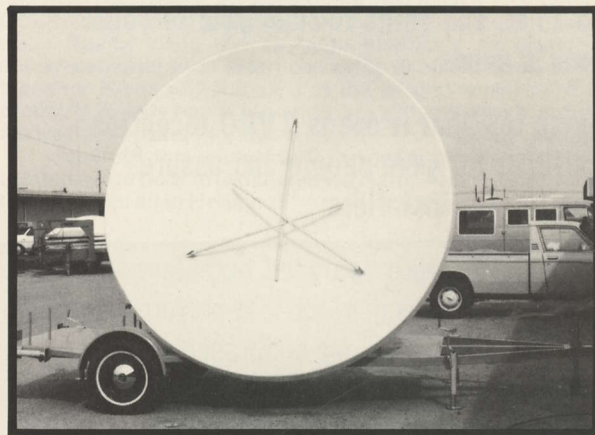
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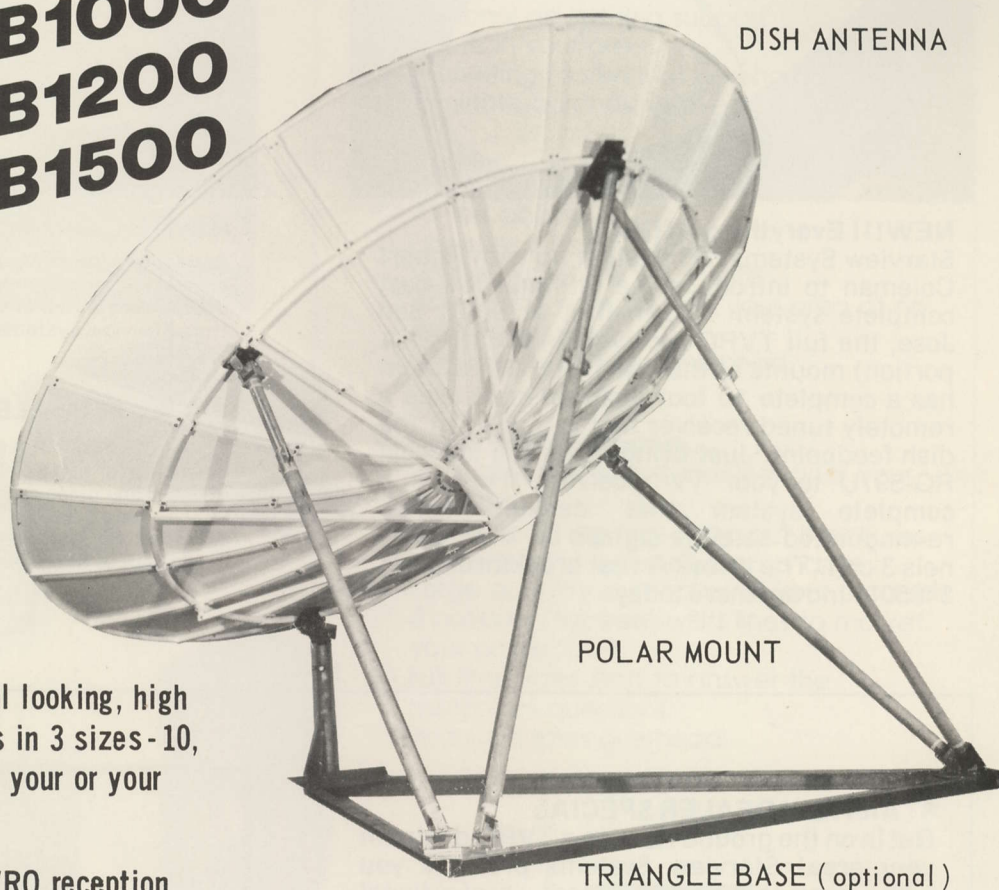
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COOP'S COMMENT ON TECHNOLOGY

MAGAZINE FUN

Getting the October **CSD** to you was an interesting experience. Before pulling out of Oklahoma for the Turks & Caicos in mid-August a carefully measured 'system' to send a box of air-freight from Arcadia to Providenciales each week was worked out. A similar system was created to get another box back to Oklahoma weekly. Each Monday an air freight box heads to Florida on Federal Express. They deliver it on Tuesday to something called Turks Air which comes down to Provo on Wednesdays with a DC3 or DC6 loaded down with goodies for the island. The first week out Rick Schneringer's box arrived almost on schedule; Saturday rather than Wednesday but close enough. **The next box took four weeks.**

Going back to Oklahoma I had arranged with a private pilot to haul small parcels and large envelopes to Miami where he was to drop them into the US mail system. I sent **all** of the October magazine copy that way between August 20th and September 1st. By September 15th **none** of it had arrived in Oklahoma.

So I arranged, via Haiti, to get back to the states on the 16th. It was a long, 12 hour series of airplanes blessed by late flights and an aborted attempt to hi-jack to Cuba a plane that had it not been detoured towards Cuba would have left Miami (as the last plane that day) for Dallas hours before I finally got to Miami. In Oklahoma, the type setter worked overtime to set all of my redone October copy into form in 24 hours and then I worked all night to get it 'pasted up' for the printer. Then I spent two days in Oklahoma using our STT telephone to run down the latest news and generally take the pulse of the industry. A final day was spent pillaging the local super markets and specialty shops to round up a long list of much needed parts and goodies to haul back to Provo. On that Friday afternoon I carted 15 containers weighing 515 pounds to Emery air freight for shipment to a clandestine address in Florida where it would then be brought down to Provo on a private two-engine plane.

Saturday morning with the October **CSD** safely in the printer's hands our small poodle Marcel and I boarded a 6:45 AM flight in Oklahoma City headed back to Provo via Dallas

and Miami. With two hours in Miami I felt that I had sufficient time to get Marcel and my baggage off of Braniff and up to Air Florida for the flight down to Grand Turk. I did but only with seconds to spare. All the way to Grand Turk I worried I would never see Marcel again. I hurried through Grand Turk customs and headed for the baggage claim area just as Air Florida was warming up the 737 engines to head for Puerto Plata. **No Marcel.** So I leaped over a fence and ran onto the runway shouting 'Live Dog'. Now that I think back on it, that probably didn't make much sense to the ground guys motioning the 737 out onto the runway. None the less they somehow grasped my meaning and motioned the plane to a halt. As two husky chaps escorted me back behind the fence the baggage hold was brought down and out came Marcel in his 'Live Dog' container.

By this time the dog had been in a container for perhaps ten hours. So I let him out, shared a can of ginger ale with him and waited for Turks and Caicos National Airline (TCNA) to round up a pilot and the rest of the passengers to head back west to Provo. 90 minutes later we were airborne again. I had elected to hold Marcel in my lap since the 9 place TCNA plane is not much for baggage comfort. Our first stop was North Caicos where Marcel and I got out. He spied the airplane tire and promptly relieved himself of the ginger ale. The pilot took a dim view of this and insisted I stick the dog back into the 'Live Dog' box. As soon as we took off I climbed back over the seat and released him again. On the first leg to North Caicos he had developed a severe case of 'love at first sight'; he could not take his eyes off of the beautiful sea and islands 4,000 feet below. He repeated his act by heading for a window and spent the last 15 minutes staring at the passing Caribbean below. A lady whom I suspected had 'reported' me on the first leg as having the dog 'out' even seemed happy to have him back in my lap; at least he stopped barking.

Well, Provo turned out to greet us. **"Will the TV be on tonight"** everyone asked. I had run WIV-TV only a night or two before heading for Oklahoma and the half dozen or so sets on the island were already catering to dozens of viewers each. I promised it would be and headed home for a delightful swim and a relaxing session with a snorkel and mask.

We are operating WIV on an 'experimental' basis until January 1st; that gives us a chance to build the system properly, and it gives the island folks time to get TV sets and antennas down from Miami. We operate 4 hours each night plus some extra afternoon hours Saturday and Sunday with sports feeds from the states via satellite. We tape a popular US 7-8 AM show for reshooting that day at 6 PM and follow that with a live satellite news feed at 7 PM. At 7:30 we run a 30 minute sitcom on tape and then run a feature movie from 8 to about 10 PM. Eleven year old Kevin does most of the switching and insertions and it's amazing how fast even a youngster can pick up on running a tight on-air product. His eight year old sister Tasha loads the 16 page character generator with announcements each afternoon prior to airtime and pre-rolls tapes for Kevin. By the start of the second week there were probably 25 sets operating on Provo with another hundred on the way down from Florida.

Hopefully this issue of **CSD** will get out without my having to hitch a ride back to Oklahoma via Haiti. And we look forward to seeing you all in Houston!

CSD
TECHNOLOGY



COOP'S SATELLITE DIGEST (Technology Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (STT). Editorial offices located at West Indies Video, Grace Bay, Providenciales, Turks & Caicos, BVI. Communication with editorial office is through Business Office at P. O. Box G, Arcadia, OK 73007 (405-396-2574); Rick Schneringer, Manager. Photography, Kevin Paul Cooper; editorial assistance Tasha Anne Cooper. STT produces various manuals, videotapes, guides and texts plus conducts the twice annual SPTS and once-annual SBOC events. STT is not affiliated with any manufacturer or distributor of satellite communications equipment. **CSD** subscription \$50 per year US / Canada / Mexico; \$75 elsewhere. Total contents copyright 1980 STT, USA & Turks and Caicos.

SUPER PERFORMING MOLNIYA AUDIO / VIDEO SYSTEM

Editor's Note: While the excitement of tuning in the Moscow Olympic Games has faded into history and the subject of tuning in Molniya would appear to have been worked to death, the **improvements** in receiver technology which such challenges present never stop. Satellite pioneer **Lynn Hurd** of Beaverton, Oregon attended the first SPTS event in Oklahoma in 1979 and from that experience Lynn is now up to his neck in private terminal systems in the northwest. As an employee of Tektronix, Inc. Lynn has access to technology, equipment and fellow technologists which most of us only dream of. After reading about Molniya reception in **CSD** (see July '80 issue) and attending the San Jose SPTS gathering where Molniya was shown off, Lynn returned to Beaverton where he enlisted the aid of fellow Tektronix employee **Tom Hill** to bring Molniya reception to Oregon. With the 'Tek Connection' Hill and Hurd have created a Molniya signal processing system that should make Russian engineers scratch their heads in dis-belief. Picture quality from the Russian bird is better than most private US TVRO reception as a sampling of photos here show. Hill went to work designing an audio recovery and video processing system that is clearly superior to the Birkill system detailed in **CSD** for May (1980). The equipment employed in the final system was a **10 foot dish** equipped with the Birkill hybrid mode feed (**CSD** for February 1980), a **120 degree LNA**, a Hurd assembled receiver patterned largely after the **Washburn PLL** system and a Tektronix 656A-1 SECAM color monitor. The Tek SECAM monitors, by the way, **had been intended** for NBC use in Moscow. Hurd found sufficient monitor modules about the Tektronix plant to patch together a unit for his own use in this unusual application. This Hill created report addresses his system for handling the raw video (with PWM audio) out of the TVRO receiver before it is sent onto the SECAM monitor.

While Lynn Hurd and I were working (many nights to 4 AM!) on receiving Molniya we discovered some inadequacies in the original Birkill circuit. The circuit shown here produces exceedingly high quality (broadcast standards) color SECAM video and audio from Molniya.

In my design we have a **video filter** on the **input** from the TVRO demodulator. This is a 4.8 MHz Tchebyshev design low

by

Tom Hill
2847 SW 219th Ave.
Beaverton, Oregon

OUR COVER

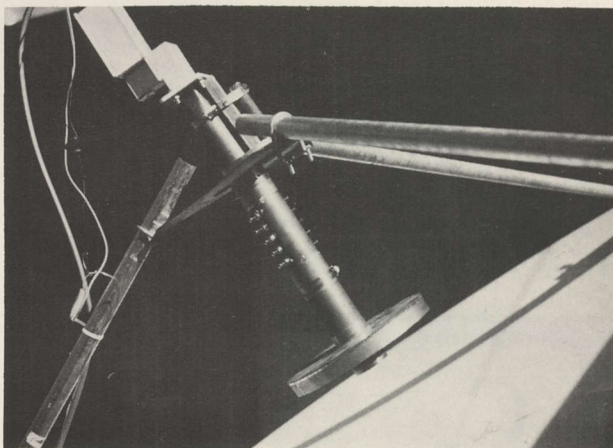
Bringing first-time TV to a forgotten portion of the world. On the island of Providenciales in the small nation of Turks & Caicos in the Caribbean this 11 foot ADM antenna receives live satellite TV. Programming is mixed with the pre-taped and locally produced programs for a complete mix broadcast over the island on VHF channel 4 with a small, solar-panel powered ten watt transmitter.



"OLYMPICS '80" programming identification from Molniya.

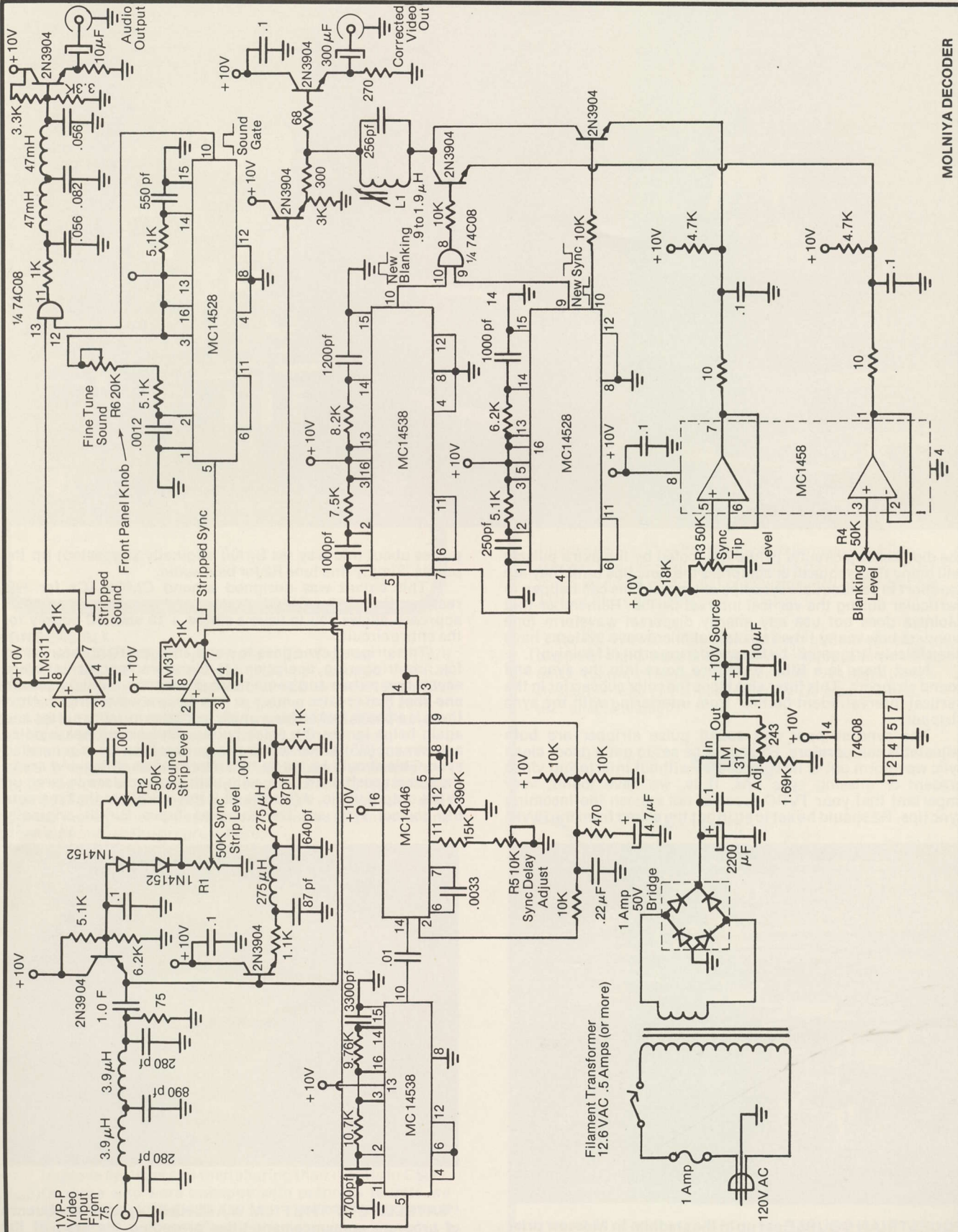


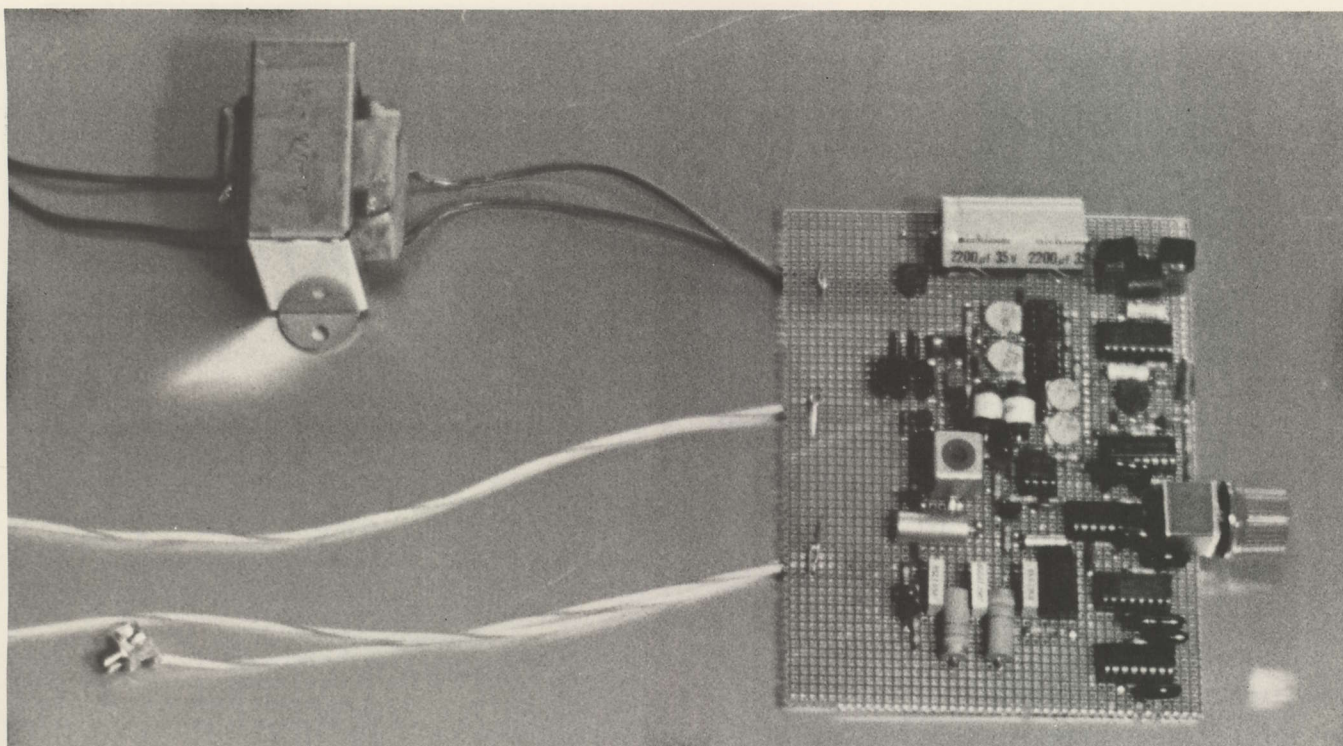
BIRKILL hybrid mode feed, 120 degree LNA at focal point.



TEN FOOT dish in Hurd's driveway in Beaverton pointing at the Molniya apogee point.

pass and its purpose is to reduce noise and eliminate subcarriers which can cause cross talk and noise pulses in the video. Next there is a **DC restorer** that has been carefully designed so it does not squash (compress) the extra-thin sync pulses from Molniya. It is, we have found, a very good idea to put un-clamped video from Molniya into the decoder because





the diode clamp circuits (while not fooled by the extra pulses) will many times squash or compress the sync tips until they are too short to be adequate sync tips anymore. This can happen in particular during the vertical interval period. Remember that Molniya does not use any energy dispersal waveform (one wonders how many times terrestrial microwave systems have been falsely 'triggered' by the wandering orbit of Molniya!).

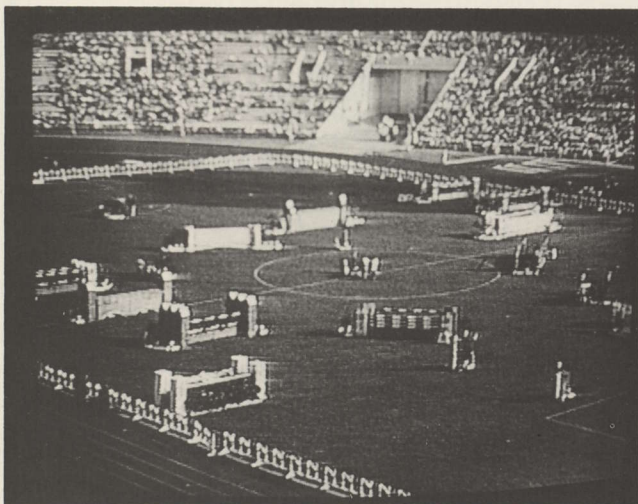
Next there is a **filter** to reduce noise into the sync and sound strippers. This filter also stops the color subcarrier in the vertical interval 'ident bottles' from interfering with the sync stripper.

The sync stripper and sound pulse stripper are both **adjustable comparators**. R1 should be set to get a good, clean sync waveform out of its comparator without interfering video present or missing sync tips. It is, we have found, very important that your TVRO receiver not squash the incoming sync tips. R2 should be set to strip out the sound from the PWM

pulses about mid-way (as Birkill originally suggested) up the pulses. Simply fine tune R2 for best audio.

This circuit was designed around CMOS ICs for two reasons; first, I like CMOS devices and secondly, the CMOS approach allows you to have a **single +10 volt DC supply** for the entire circuit.

The stripped sync goes to a **one-shot multi-vibrator** wired for non-triggering operation. It therefore ignores interlace separation pulses and some noise. Following this is a **second one-shot** that creates a more or less square wave output. Next there is a **phase locked loop** which recreates missing pulses and again helps ignore the noise pulses. This circuit has a delay adjustment (R5) which sets the proper position for regenerated sync. This should be set so that new sync and blanking are in the correct position in time, with both sound pulses covered up in the output video. After the PLL the one-shots that recreate the correct sync are the same as Steve Birkill originally



EQUESTRIAN COURSE set up in the stadium in Moscow prior to the start of the riding events.



"SATELLITE OF THE FILM WATCHER" - part of a sequence of program announcement titles preceding the start of the day's feature film. No, we don't know what it means either!

detailed.

The sound gating is also the same as Birkill's work. We installed R6 as a front panel control; it selects which audio channel is decoded and will fine tune the sound. There is a 5 pole 5 KHz Tchebyshev low pass filter in this audio line to reduce noise in the recovered audio.

The regenerated sync and blanking pulses go to a pair of clamps that clamp the output signal to levels set by R3 and R4. These are adjusted to cause the output video to have correct sync and blanking levels. R3 sets the sync tip and R4 sets the blanking level.

L1 is set to allow the 4.33 MHz SECAM color subcarrier to pass, unaffected by the blanking clamp. Our prototype unit, as shown in the photo, was built complete with a power supply on a single 5 inch by 6 inch circuit board. We are now working on the problems presented by designing a SECAM to NTSC color transcoder.

WHAT ARE OUR PIONEERS DOING?

PIONEERS ALL

When CSD began publication in October of 1979 approximately 400 individuals had pre-signed up as subscribers. Many of these individuals had attended the initial SPTS event held in Oklahoma in August of 1979 and to each of these early subscribers STT/CSD awarded a 'Satellite Pioneer' certificate recognizing the early start-up status of each.

Well, a year has gone by and when renewal notices were mailed to these Satellite Pioneers we prepared a comprehensive survey form to go with the renewal notice. We felt it would be instructional to all in this young industry to see just what progress these pioneers had made in their first 12 months and to then summarize the progress here.

First of all, more than 80% of the original pioneers re-subscribed to CSD. That's a significant response in that category although its importance can only be tabulated as a function of on-going interest in this field by these early innovators. Of those responding to the survey here is what we found:

1) **Question:** Are you pleased with the progress of the low cost satellite TV receiving terminal hardware in the past 12 months?

Response: 95.7 % said 'yes' they were pleased; 4.3% said 'no'.

2) Of those who were pleased with the progress we asked them to indicate by free choice what aspect of terminal progress most pleased them.

Response: 71% cited lower equipment pricing, 18% cited the availability of new receivers. Other subjects mentioned were the formation of S.P.A.C.E., new antennas, the development of the image reject mixer (see CSD for June 1980) and several commented on the positive aspects of individual experimenters trying to improve systems and then sharing their results in CSD.

3) Of those who were unhappy with progress to date we asked them to indicate by free choice what bothered them most.

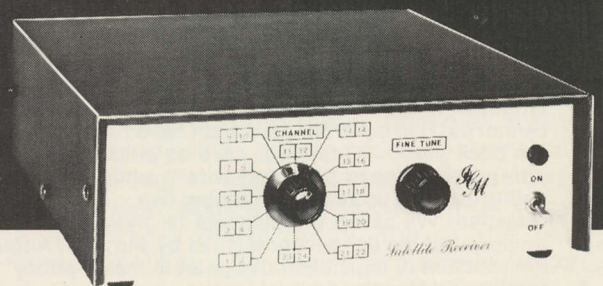
Response: A lack of available parts bothered many, LNA

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The TV-4300 is a fully packaged and assembled receiver complete with a built-in LNA power supply, built-in AFC, tuner, control circuitry and power cable. All output levels compatible with video monitor and VTR input. Easy to use! Simple tuning!

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Six frequency, crystal control, audio with stereo output. (Factory installed 6.2 and 6.8 MHz crystals supplied) \$89.50

Other audio frequency crystals \$9.50 ea.

Model TV-4300A . . . supplied with remote control and six frequency, crystal control, audio with stereo output \$1,149.00

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pricing (in spite of recent price drops) bothered some and other topics mentioned included the slow development of quality kits and 'poor engineering'.

4) **Question:** Do you presently have a terminal operational?

Response: We were quite surprised to see that 37.8% of the respondents said they **do** presently have a terminal operating. In terms of the pioneer group that translates to 145 terminals operating.

5) **Question:** Your operating terminal is all homebrew, partially homebrew or all commercial?

Response: We found that 14.3% (equals 21 terminals) were totally homebrew; 57.1% (equals 83 terminals) were partially homebrew (antennas were cited most often although there was no space on the form for the respondent to indicate what was homebrew), and, 28.6% (equals 41 terminals) were all commercial.

6) **Question:** If you do not have a terminal now operational, do you intend to have a home terminal within the next 12 months?

Response: We found that 86.5% of those who are not operational (equals 208 pioneers) plan to be operational in the next year. We also asked that they specify what portion of the terminal is giving them the most difficulty. Selecting a site was high on the list ("My wife says I cannot put it in our front yard and I have no clearance in the back yard! Guess I'll have to either move to a different location or get a new wife") while parts availability cropped up as a close number two.

7) **Question:** We asked the pioneers to give us their impressions of the dangers presented by the July/August introduction of legislation designed to make 'piracy' of satellite TV signals a federal crime.

Response: 62.3% felt that the bill, if passed as originally written, **would have** much effect on the growth of low cost private terminals. Another 22.6% felt the bill would have some impact while 15.1% felt the bill would have little impact.

8) **Question:** We asked specifically how they felt passage of the bill, if adopted as written, would impact on the commercial manufacture and sale of low cost (i.e. private)

home terminals; **as opposed** to the homebrew or self assembly of terminals on a private basis.

Response: 2.4% felt the bill would have **no** impact on commercial hardware sales; 22 % felt the bill would have substantial impact and **75.6% felt** the bill would have '**Drastic effects**' on the commercial production and sale of hardware.

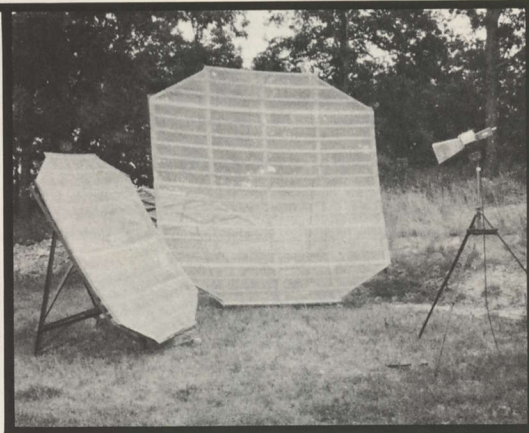
Interestingly, this difference in private **use** and commercial **manufacture** was also noted by S.P.A.C.E. General Counsel Rick Brown when he began the long battle to keep the legislation, as originally written, from proceeding through the House **this** session. And it was here that S.P.A.C.E. first struck pay dirt by getting the manufacture and sale of such hardware initially **removed from** the language of the bill.

9) **Question:** What are your suggestions for getting this bill modified before it becomes law, to make it more palatable to private terminal owners?

The responses were varied. "I feel most strongly that if the bill were to become law my rights would be severely abridged **and I don't like that**". And, "I suggest we get it modified so that private viewing where no financial gain is involved **is legal**". And, "We must **educate our elected officials** on the seriousness of this problem and how ultimately it will effect a large percentage of the American public". "We must all **write letters** to our Congressmen". "We simply must get **more private terminals** operating so we have clout; we also need to enlist the aid of other groups such as the Farm Bureau who have a stake in this whether they know it or not". "I suggest we get a **bill sponsored** in the House that gives private terminals total free use of all satellite signals; then we can **negotiate** a compromise between the two extremes". "We should threaten and then carry out **lawsuits against** the programming firms charging them with discrimination; they sell to **groups** of individuals who are served through cable firms or motels, **why not single** individuals? That is discrimination!!!" "The bill should simply address (re) **sale of** satellite programs and fines should apply **only** to those who re-sell product without a contract or authority". And, "We should lobby big, everyone should write **and call** their legislators, and

THE UNBEATABLE PAIR!

BY NOW virtually everyone knows you have at least two good choices when selecting your satellite TV antenna. The parabolic dish, and, the Spherical. And most people now know that the Spherical offers advantages no parabolic can offer. Such as multiple-satellite visibility, far lower wind resistance (the winds blow through the surface), and not insignificantly lower cost.



THE 8-BALL is the leading antenna line in the Spherical field. Hundreds of 8-Ball antennas are now providing high quality reception from Canada's frozen north deep into Mexico and the Caribbean. Our popular 12 foot size is now joined by a new 8 foot 'demonstrator special' which extensive testing reveals will perform as well as or better than any 10 foot parabolic on the market today! PLUS - with an 8 foot trailer mounted you can demonstrate the length of the full satellite belt (over any 30 degree span) right at your customer's location by simply moving the feed antenna from bird to bird; leaving the Spherical reflector surface 'in place'. BOTH the 8 foot 8-Ball and the 12 foot 8-Ball are now available in the standard mesh and a new 'tough mesh' for extra rugged applications. Pricing remains \$750 for the standard 12', \$780 for the ruggedized version while the new 8 foot is priced at \$650 for the standard mesh and \$685 for the ruggedized version.

SHOPPING FOR THE BEST LNA BUYS? Check with 8-Ball **before** you order because we'll give you a price on brand-new factory sealed Avantek 120 degree (50 dB gain) LNAs with the DC power block that will knock your eyes out!

we should bombard Washington with paper; that's the only thing **they understand**! And, "We have an educational job to do; most legislators **never heard** of private satellite TV; we have to show them what it is, how it works, and why it is good for the people". "Brown has the right idea...**modify the bill** as many times as possible, at every possible turn, to make it functionally worthless". "I am **sending my Senator** a copy of the August Coop's Comment appearing on page P2". "We have got to make Congress understand that **we are not pirates**, that we are willing and able to pay for the services provided they charge a reasonable fee **and** they are willing to accept our money. The HBO position of refusing to accept money from us is our best weapon. That's discrimination!" "I easily understand the posture of HBO and Showtime; they want to protect **their** rights. However the private terminal operator should be able to **'purchase'** these rights based upon the same cost-per-customer formula used by the cable companies". "The bill is attacking the **wrong problem**; it should be amended to require that the services **must accept** our money, not make it illegal for us to watch them when **they refuse** to accept our money". "Zero in on **our willingness** to pay fees if the parties on the other side would simply accept our money".

10) **Question:** Do you feel confident that a united group of satellite enthusiasts can effect the way this bill is passed?

Response: 88.9% felt confident that S.P.A.C.E. **could change** the outcome of the bill; another 11.1% felt that the bill would be passed as written. One of the negative votes added "**Big money talks and we are simply small people without much clout**". Fortunately, as events have passed, this respondent was not correct. Just about the same ratio of pioneers (90% yes, 10% no) indicated that S.P.A.C.E. deserved the support of all enthusiasts.

In the last portion of our pioneer survey we asked the respondents to indicate what types of material they wished to see carried in **CSD** on a regular basis. We provided a long list of topics and they indicated in which areas they did and did not want more material.

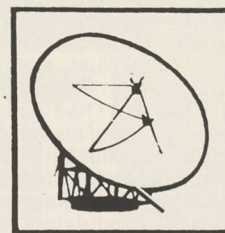
Topic	More Data	Less Data
DOMSAT	39.0%	1.4%
Non-DOMSAT operations	20.3%	13.0%
LNA construction	31.9%	2.9%
Antenna construction	42.0%	8.7%
Receiver construction	30.4%	0.0%
Terminal maintenance	40.6%	0.0%
Equipment reviews	43.5%	0.0%
Equipment sources	55.1%	0.0%
Parts sources	43.5%	2.9%

As we have previously indicated, **we recognized** that there continues to be less than universal interest in non-DOMSAT reception services. However, it is difficult (if not impossible) to **ignore** innovation in technology in this area (witness our re-visit of Molniya PWM and video processing systems in this issue) when someone out there sits down and does some really creative work. Everything we do, whether it is for DOMSAT reception or for international reception, has a way of cross-pollinating everything else we do. And **ultimately** there will be more international reception viable than there will be domestic reception available.

SOAPBOX

"We need some articles on building high quality video/audio modulators for MATV system use" (**Anderson**, Red Wing, Mn.). "How about an educational series, starting with the very basics and progressing to advanced theory?" (**Smith**, Gonzales, La.). "Prices are still high on many (parts) items and service is poor" (**Whear**, Carson City, Nv.). "We need a trading post or classified section where readers may buy and sell private TVRO equipment" (**Spurlock**, Santa Barbara, Ca.). "There needs to be more firms who will do business via mail order and who will do business with private individuals" (**Brown**, Learmouth, Western Australia). "I would like to see more details on both design and construction of LNAs and bipolar mixers" (**Wardlow**, Riverdale, Ga.). "Would like to see critical evaluation of equipment such as Rohner's combo unit (LNA and receiver) on Barker's receiver (image reject

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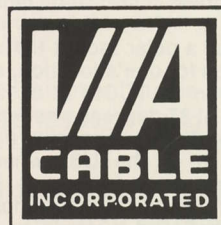


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mixer); it is very difficult to determine which unit to buy without appropriate evaluation or critical comparisons" (Hughes, Cypress, Ca.). "I am building the Washburn receiver and just starting the Nelson parabolic" (Hart, Kerman, Ca.). "When I read Coop's first article in TV GUIDE, I just knew that I had to have one of these things. At that time it was way (!) out of my reach but by late in September I should be operational...thanks!" (Burns, Wheelersburg, Oh.). "We need details on interfacing satellite signals to MATV systems; there is a big market here. How about discussions of using mid-band modulators and block converters?" (Carey, Cardiff-By-The-Sea, Ca.). "How about regular information on the current back order (waiting time) status for each manufacturer?" (Straub, Cambridge, Ma.). "I'd like to see a monthly article which lists the tops (vs performance vs ease of assembly) in the areas of receivers, LNAs, antennas, etc.; the column would have to be non-biased in order to have credibility" (Speary, Barnesville, Md.). "How about details of subcarrier services including encoding and decoding formats?" (Waltner, Indianapolis, In.). "We need details on starting small cable companies to legitimize neighborhood installations (Hurd, Beaverton, Or.). "Is there some easy way to see, before you buy, whether a particular package will work in your area?" (Bender, Pittsburg, Pa.). "You should give S.P.A.C.E. more space in CSD!" (Harrington, Columbus, Oh.). "I would like to see more objective reports on equipment" (Scherch, Homer, Ak.). "Please retain the three-hole punch for CSD storage" (Sloan, OKC, Ok.). "We need an article on cable and connectors" (Clark, Tulsa, Ok.).

REMEMBER -

This was a look at only those CSD readers who qualified as pioneers by being subscribers prior to the release of the first issue in October 1979. If you are not a 'Satellite Pioneer' we'd like to hear your own comments on the progress of the industry during the past year!

MOTORIZED CONTROL WHILE SCANNING THE SKIES

POLAR PLUS

Based upon the success of the Steve Gibson 'SATELLITE NAVIGATOR' manual from STT, apparently a lot of people are concerned about getting a good mounting system for their parabolic antenna. With the rapid growth of programming on multiple satellites the ability to move rapidly and accurately from one satellite to another becomes more and more important.

The ideal system would perhaps be a polar mount that is adjustable to the appropriate declination for one's location, so designed that the antenna will move from SATCOM F1 at 135 degrees west to at least COMSTAR D3 at 87 degrees west and preferably would also move into the far eastern sky (for observers in the eastern 1/3rd or so of the US) where INTELSAT and GHORIZONT are active.

The ideal system would be motor driven from a remote location (such as at the TV viewing spot) and it would have some type of readout system which would transmit to you at the

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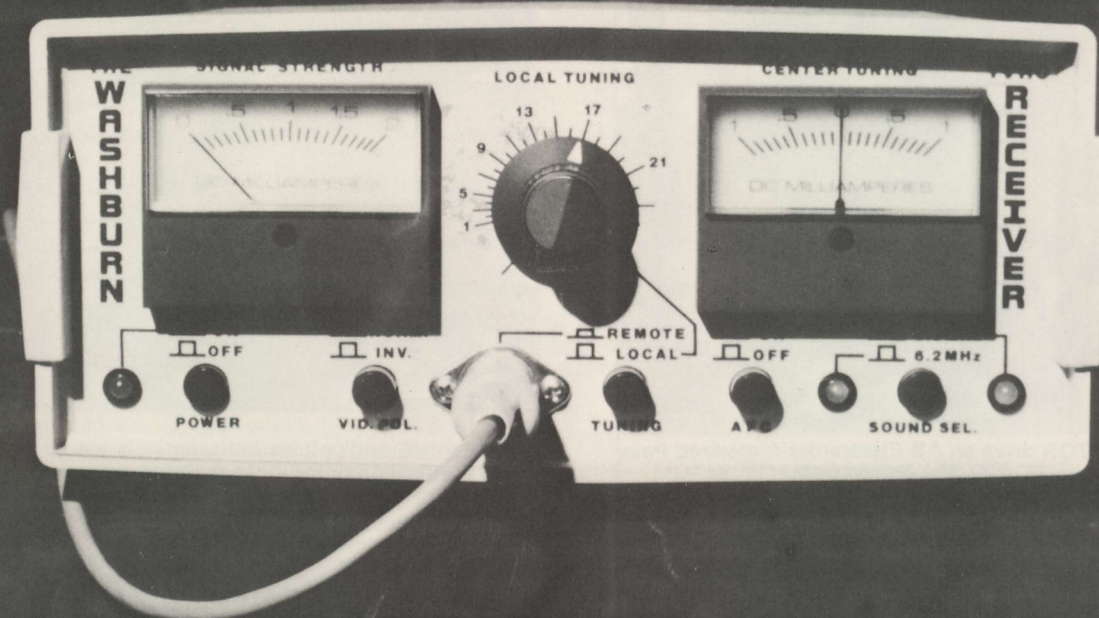
SYSTEM V - SAT-TEC R-1 Receiver, Prodelin 10' Antenna, one Avantek 4215 LNA, Modulator, Cables.

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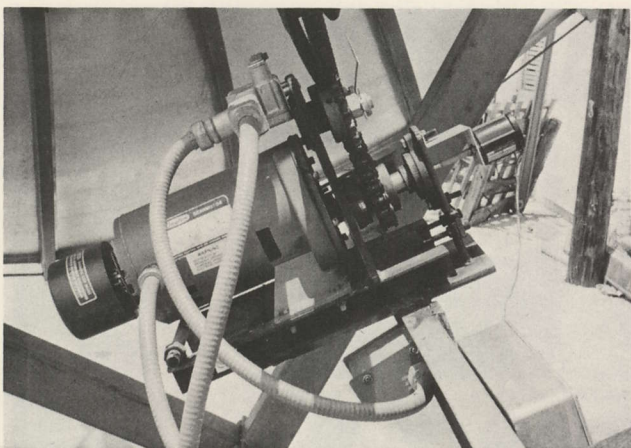
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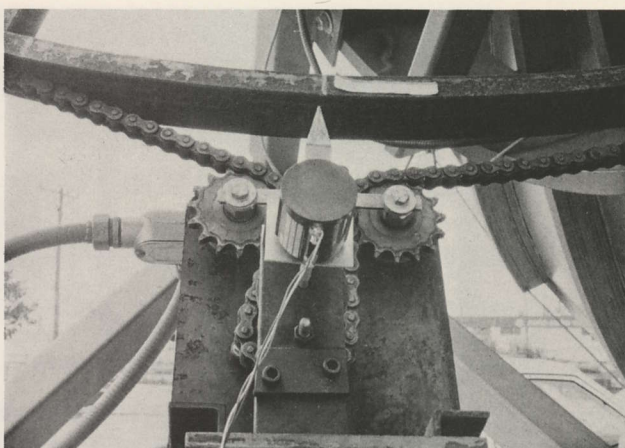
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ELECTRIC MOTOR drive on AB Electronics Motorized Polar Mount system mounts under the dish on frame.

viewing location precisely where the antenna is at any moment. Similarly, the ideal system would give you a 'static check' of the antenna's location at any point in time so that you could glance at a control knowing which satellite you were pointed at after not using the system for some time.

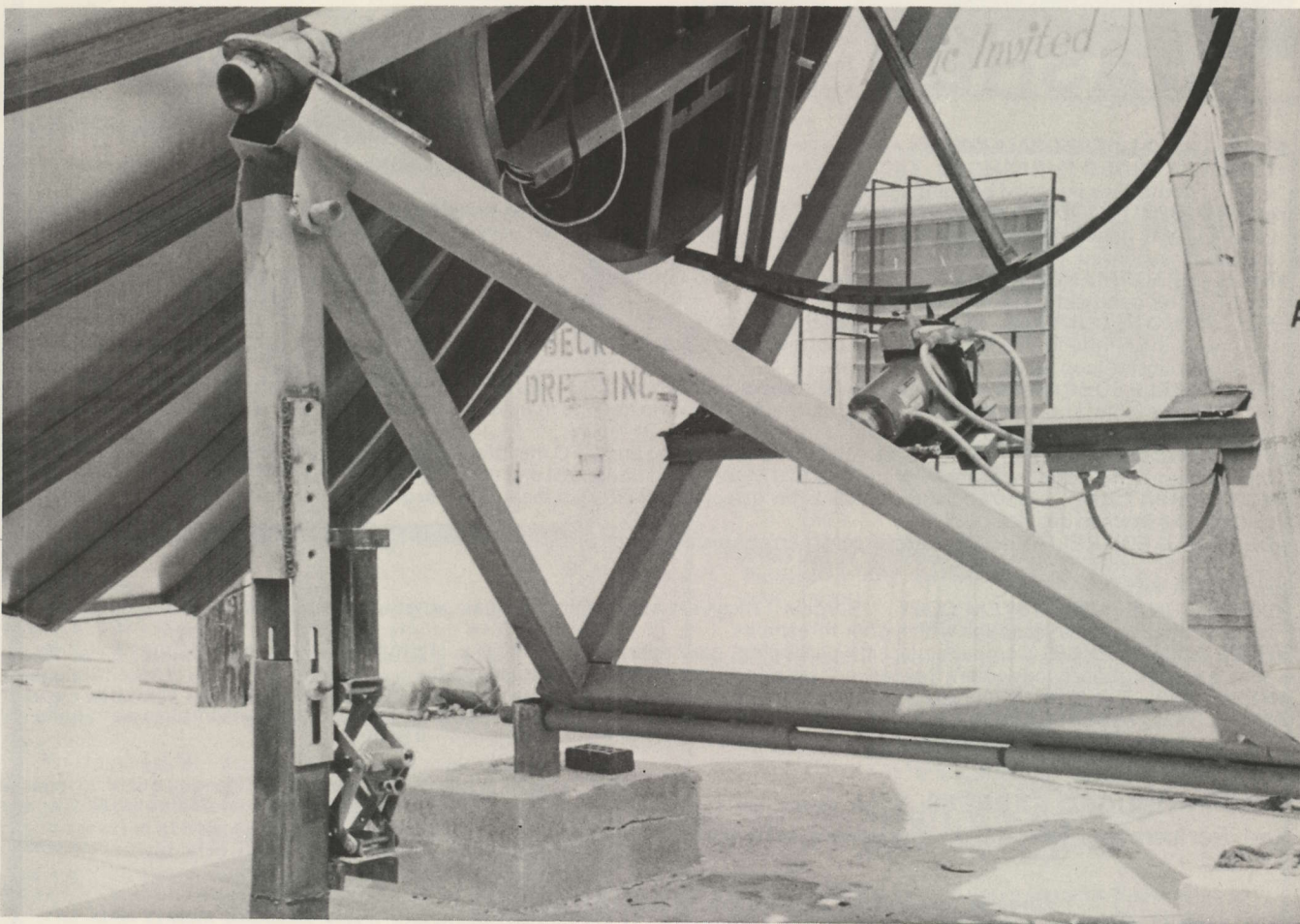
Finally, the ideal system would be strong and stout capable of taking whatever forces of nature you are likely to



GEAR DRIVE and pointer indicator tells you at the antenna where the dish is pointed at the moment.

encounter in your own region of the world without risk of losing the dish or the mount or both.

In the Gibson 'SATELLITE NAVIGATOR' manual from STT Steve discusses the nitty gritty problems associated with obtaining a positive position indication and stable read out of the dish location with any motorized mount system. There are several simple schemes about including the use of precision

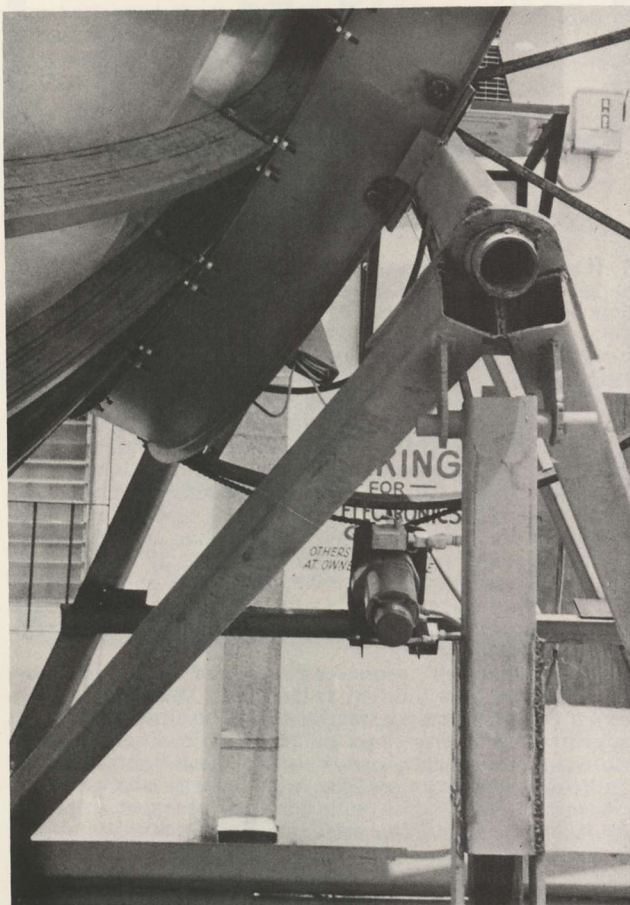


ESSENCE OF THE AB motorized mount system; rear portion 'hinges' for tracking with adjustable front end inclination system. Polar mount axis rod floats top and bottom in collars and is driven by chain drive track and electric motor.

pots which provide a 'feedback' loop to the control position. Perhaps for regular use and 100% user satisfaction, the one area of a motorized mount which still begs the most attention is the 'antenna readout system' that does in fact tell the user precisely where he is pointed.

Last August CSD visited Bob Behar at AB Electronics in Hialeah, Florida (1783 W. 32nd Place, 33012; 305/887-3203) and saw a demonstration of a proto-type polar mounting system that comes close to fitting our criteria here. Behar was using a Paraframe 4.85 meter (15.9') parabolic at the time and as CSD readers for this past September know he was tuning in the Russian Olympics at the time from Ghorizont at 14 degrees west. His mount had to be stout since the Paraframe dish is one of the heaviest antennas around.

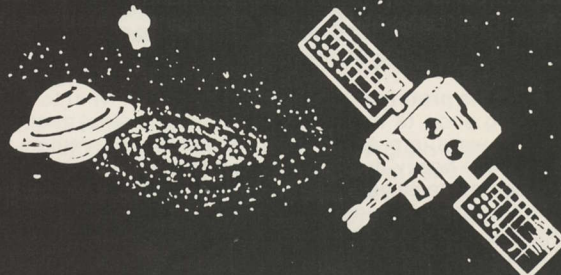
The AB 'Motorized Polar Mount' is a relatively simple system employing a heavy duty chain drive driven by a stout electric motor. The chain rides in a trough fabricated into a circle. The motor is reversible. From the control position you have either a three position switch (east, off, west) or optionally a 12 position fully automatic servo system. With the 12 position system you simply switch to the bird which is programmed for that position and activate the motor drive. The antenna moves automatically to that position and shuts down. An LED indicates which bird you are positioned for should you forget where you were.



'A' FRAME CONSTRUCTION looking from front [closest to ground] end towards rear; nose or front end adjusts manually up and down for preliminary positioning of antenna inclination.

Behar has attempted to design the mounting system so that it will accommodate most of the 'bigger' private terminal dishes around. The mount itself is a series of 'A' frames with a set and forget adjustable front leg which allows you to get the angle of inclination for the polar mount support tube for your specific location. Naturally you want to be very sure that the

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polar mount axis is precisely in a north-south line before you pour any concrete. Behar recognized that some people might make errors here so he has built in a **range of adjustments** for the installer that allows you to correct for such errors in calculation. His theory is that it is better to provide adjustments for the installer than to have people sink everything into concrete and then discover too late that they missed north-south by a degree or two. So by having fine adjustments on both north and south and the angle of axis the user should be able to set up the mount for virtually any latitude.

With the prototype work done Behar then went to a metal fabricating shop to have the units put into final production form. We were impressed with the techniques we saw there including the heavy duty painting and finishing to protect the mount against most environments. The unit knocks down fairly compact for shipping and goes together at the site in a few man hours time with typical hand tools.

In operation we witnessed the Paraframe 4.85 meter dish move from Ghorizont II at 14 degrees west all the way across to SATCOM FI at 135 degrees west without missing a bird. That impressed us since the two extremes were in the 10 to 20 degrees-above-the-horizon range at each end of the sky. There is some noise associated with the chain drive but it shouldn't bother most people (being outside anyhow). The one area we saw which did give us some concern is the open-trough which carries the chain drive. After debating the merits of belts and gears we agree with Behar that the heavy duty chain is the right choice. The chain encircles the full antenna in the trough and wraps around a set of guides to a drive sprocket on the motor shaft. We feel it would be possible to enclose the trough proper thereby protecting the chain for perhaps 95% of its surface area. Not enclosed we see possible problems in areas where there is freezing in the winter (snow may pack into the trough and freeze the chain in place) or where there is lots of corrosive salt spray in the atmosphere (unprotected metal will rust almost overnight next to the seashore). In either event we recommend that anyone using an outdoor chain drive such as

this be prepared to lubricate the chain frequently and see that it is protected against mother nature.

AB Electronics has been in production with the 'Motorized Polar Mount' for a couple of months now. The base price, FOB Miami, is \$1500 for the unit with the simple east/off/west control. For the 12 position servo pre-set model add \$150. Behar recently completed checking the mount out using a new prototype Paraframe 6 meter (nearly twenty foot) antenna which weighs appreciably more than the 4.85 meter antenna and found that his mount is more than stout enough even for these large antennas.

LNA DESIGN & APPLICATION NOTES

WHEN IS A 120K LOW NOISE AMPLIFIER NOT A 120K LOW NOISE AMPLIFIER????

It is well known to most people who are manufacturing, selling or installing TVRO systems that certain combinations of components work better than others and that some do not work at all well. The purpose of this note is to make clear the reason for difficulties with certain receiver-LNA combinations and to present a solution.

All of the new, inexpensive receivers share a common design characteristic, they have no front end selectivity, i.e. the first mixer is connected directly to the input connector with no intervening band pass filter. This is all right as long as the amplifier(s) ahead of the mixer have gain and output only at the desired frequency (3.7 to 4.2 in the TVRO case). It is not all right when the amplifier has considerable output at the receiver's image frequency, for this energy cannot be recognized as different by the mixer and simply gets folded on top of the desired signals. If it is a lot of energy the picture will be severely degraded, if it is a little energy the picture will suffer only slightly.

The "Expensive" receivers get around this problem by providing band pass filtering at the input. This is one of the reasons that they are expensive. It is also the reason that amplifier manufacturers have not had to be overly concerned about the amount of out of band noise produced by their LNAs.

We have now come to a point in the industry where this is a serious consideration for both the receiver and amplifier manufacturers. I have therefore examined a number of the commercial LNAs both with a spectrum analyzer and with a "barefoot mixer" receiver to see what problems exist. I did not open any of the amplifiers to see if they do have bandpass filter circuits.

I don't think that the amplifier manufacturers should be blamed for producing image noise - those of us who are designing and manufacturing receivers should work out the problem with them so that we can still produce the least expensive system. There is tremendous pressure on all of us to produce the lowest cost system components with the only specification being that the consumer get a good picture. Engineers find it difficult to work with a spec of that kind and, therefore, most of the amplifier and receiver manufacturers I have visited have put their own terminals up and have bought

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all of the presently available receivers and/or LNAs so that they can do system level testing on their own.

For example during a visit to AMPLICA recently I found that they had become concerned about the image noise problem and had done experiments with nearly all of the commercial receivers available. The end result of this work is that AMPLICA is coming out with a new model amplifier designed specifically for use with mixer front end receivers. This amplifier has filtering which eliminates a low side image noise. Further AMPLICA will retrofit any of its units now in the field with the filtering if the customer has image noise problems.

As mentioned above I found that bandpass filtering improved the picture in every case. I have therefore begun to produce a band pass filter-amplifier combination one version of which will go in any future receiver designs and another version which will be available commercially from International Crystal as 'The Purefier.' It is a one inch square box with an N connector on either end and is about 4 inches long. It is a bandpass 900 MHz wide centered on the TVRO band and contains a single transistor amplifier. Insertion gain is about 7 dB and the power required is 15 volts at a few milliamperes.

In conclusion if your installation or ones which your company has done doesn't quite measure up to what was expected (or doesn't work at all!) I would suggest trying a bandpass filter first. This is particularly true if you are using a low cost receiver. If that doesn't cure the problem then look elsewhere, but, if it does you will know that you have found it and have several ways to go - leave the filter in or contact the LNA manufacturer for help with reducing image noise.

H. T. Howard
Stanford, CA

TECHNICAL CORRESPONDENCE AND NOTES

SCRAMBLING?

Over the past two years I've become interested in home reception of satellite television signals. However in the past few months I have heard the possibility, some call it a certainty, that the signals in question will soon be scrambled to prevent home reception. In a letter to me W. D. Godfrey of the University of Victoria warns 'The signals belong to the sender. The cost of scrambling is 1 to 2% of total costs. I'd say that within 3 years 10% of all signals will be scrambled. And in 5 years I'd guess 80% will be scrambled'. Can you please tell me, how great a danger is there of this happening?

Paul Manning
Vancouver, B.C.

There are several viable, proven techniques for scrambling video signals. Some are inexpensive for the uplink station but may increase the cost of a downlink [receiving terminal] by as much as 50%. Others are not terribly expensive but they degrade the video signal to noise ratio which has the effect of making receive terminals use larger antennas to maintain their

present high quality reception. The most secure systems are the most expensive, at both the uplink and downlinks. The major users of programming that is attractive to non-authorized users is the cable programming on FI. Unfortunately this is the very group which has the smallest receive terminals, with the least invested per terminal and the most to lose in signal quality if more complicated scrambling techniques are employed. We suspect Godfrey is correct when he predicts 10% of all transponders may be scrambled within 3 years. But we suggest he is far off base when he predicts 80% will be scrambled in five years.

POWDERED DISHES?

I am thinking of making 16 foot fiberglass dishes and am wondering about using powdered aircraft aluminum as a reflector surface. On a fabric aircraft 4 coats of dope mixed with the aluminum powder will stop the light from a 100 watt bulb held right next to the surface. The surface when so coated will not conduct electricity but what about it reflecting microwave? Where could I find good data on reflector surfaces?

Mike Waller
P. O. Box 1656
Kodiak, AK 99615

One fiberglass antenna technique popular with the high dollar commercial boys is 'flame spraying' where powdered aluminum is coated against a fiberglass dish form under intense heat and pressure. The experts tell us that aluminized (i.e. powdered) paint is not sufficiently thick to form a reflective surface for 4 GHz signals. I'd suggest that you take a fiberglass form and try it. If it doesn't work you can always go ahead and surface it with fine mesh (as many of the home fiberglass antennas do, in a sandwich of fiberglass) or with a thin aluminum sheet as Nelson Ethier describes in his STT parabolic antenna manual.

HELP

I have built the Howard-Coleman receiver, active mixer plus a home-made LNA and the Swan antenna. My problem is how to couple the LNA into the Swan feedhorn. I have all of the manuals and cannot find this information any place.

Bruce Westphal
Westphal's TV
Iron River, MI 49935

Build up a section of waveguide from brass or copper that extends from the flange plate on the Swan feed horn back an additional 2.5 inches. This section of waveguide should measure 2.3" on one side by 1.15 inches on the other side and have a full plate across one side. The opposite side will have to flange to the Swan horn. On the 2.3" wide side go forward .625" from the closed-end plate and drill a hole to accept a type N connector (or SMA if you desire). Install the connector in that hole, centered on the 2.3" wide side, and extend the type N pin so that it is 9/16" long.

UP AND RUNNING

Please enter my subscription for one year of CSD. I am now operational with one of the Stanford 'mills cross' ten foot antennas and a button hook feed driving a Dexcel 120 degree K, 50 dB gain, LNA and an International Crystal 4200 satellite video receiver. I am driving the satellite RF signals through around 40 feet of RG214 and in 34-35 dBW EIRP footprints I receive a pretty fair picture. Thank you for all your efforts to get us all together.

James R. Matheson
Torrance, CA 90505

Welcome to the operational video set! We'd like to run a listing here in CSD from time to time of those operating terminals where the owner/operator is willing to show off the satellite system operational to others in the area interested in seeing how one works. If readers who don't mind sharing their

knowledge with others would drop us a line and indicate that you would be happy to demonstrate terminal operation, we'll see that such a listing is compiled here. Conversely readers who want to locate other enthusiasts in the same general area to exchange notes and construction design problems and solutions would write, we'll create a 'assistance-wanted' listing as well. We all need to make a concerted effort to 'get together' on the local level as well as the international forum offered here by CSD.

BEAUTIFUL

I am now up and running and the pictures are wonderful. This all started when I got to squeeze into the Oklahoma SPTS last summer. My antenna is an ancient telco discarded Gabriel and I had it installed on a trailer so it can be pulled about for demonstrations and show 'n tell.

John Tutt, Pioneer #195
Telluride, CO 81435



John's antenna and installation looks very good indeed.

REF MOTHER

We read with great interest Coop's interview in the current Mother Earth News and could not agree with you more. It might be added to his comments on network TV programming that FM radio too seems headed into that same direction. AM radio as a group have exceeded the worst of network television; thank goodness for cassette tapes! We live in a deep valley and are not sure what our chances might be with satellite TV but would like to give it a try. Hopefully we will be able to see Coop's program one of these days!

Joe D. Kingsley
Moab, Utah 84532

The May-June issue of Mother Earth News contained a 'Plowboy' interview with Coop. It discusses the plight of those unfortunates who live where television is not available and touches upon the history of the development of over the air telecasting and cable TV in this country. The bottom line hopefully is that through satellites a wider, more diverse programming community will result.

NOT US

Could you please inform me of the identity of the gentleman who spoke on the subject of classroom discipline over satellite TV on March 29th? This program was seen on the Rockford d(II) CATV system and we would like to contact him for the purpose of conducting a school workshop.

Dave Sopocy
Bourbonnais, IL 60914

Sorry. No one in 'our group' knows about classroom discipline, although our SPTS sessions could probably use some!

TECHNICAL NEWS NOTES

FCC ACTION to allow low power (10 watt in many cases) TV 'transmitters' to be placed on air in any area where the new transmitters won't cause interference to existing stations is creating considerable stir. FCC wants to allow 'small communities' in rural areas 'opportunity for expression' and new rules now proposed and under intensive work will make it happen. Very few rules (technical, legal or financial) are proposed and as they evolve we'll have a full, detailed report here in CSD. Stations will be allowed on VHF or UHF with primary concern that they not cause interference.

SIMILAR FCC proposal would add new VHF channels to several dozen US cities including Chicago, with three or more to cities such as Fresno. New VHF 'drop-in' channels would have to employ directional antennas in many cases to 'protect' existing co-channel or adjacent channel stations already operating.

NOT EVERYONE thinks 3 meter (10 foot) dishes are suitable for cable services. National Cable Television Association (NCTA) has issued 'warning' to members advising them against installing new 3 meter dishes (used primarily on WESTAR by SPN and other groups pushing their new services on WESTAR). NCTA suggests in warning that FCC is considering reducing satellite spacings from present 4 to 5 degree spacing to perhaps as close as 3 degrees. NCTA believes three meter dishes cannot separate satellites spaced at 3 degrees. Others (including Tay Howard) disagree with understanding that satellite feed system must be optimized for performance.

THREE NEW ATT birds are planned with telephone giant finally going it directly after sub-leasing from COMSAT (COMSTAR bird) since it entered field. ATT new Telstar bird (name first used with experimental 1962 bird) will be 24 channel, 10 watt power per transponder, with 'useable' signal levels over all 500 states plus Puerto Rico and US Virgin Islands. 1983 is proposed launch date for all three birds. Birds would be bought for approximately \$140,000,000 from Hughes.

SCIENTIFIC ATLANTA, unable to get strong foothold in private TVRO field, is finding other outlets for its 3 meter (10 foot) dishes. SA announced it is supplying approximately 400 such dishes to California Microwave for their AP system now going in.

BATTLE OF LNA numbers continues. Satellite Entertainment Systems (SES, 2000-67 S. Escondido Blvd., Escondido, CA 92025; (714)746-2350) now announces a 78 degree Kelvin unit; they claim this is the 'lowest' noise temperature of any 'uncooled' unit available but mention no price. Recent drop to \$1995 of 85 degree K unit by AB Electronics has created considerable stir as well. SES also offers a 55 degree K unit using thermo-electric cooling.

COOP'S COMMENT ON PROGRAMMING

PROGRAMMING A-GO-GO

One year ago we suggested that home terminal operators were beginning to have more video available via the birds than any one person (no matter how devoted) could keep up with. We suggested that those who ran across unusual programming (i.e. not listed in **SAT-GUIDE**) should send details of such reception along to us and we'd share it in our Programming Section each month. In fact our "On The Birds" segment that appears to the end of this section of **CSD** was begun for that purpose.

ALAS - too few people shared and so we quietly dropped the project. Now along comes Lynn Hurd of Beaverton, Oregon (his address is 4880 SW 195th Ct., 97007; you'll see why we tell you this shortly) who raises anew the proposal that those of us equipped with the capacity to move dishes around begin taking notes and sending the data along for 'sharing purposes'.

Lynn suggests "Let's have a section in **CSD** where we publish a running 'log' of what is being seen, by whom and when. Many of us now have motor driven antennas and once you have such a system it quickly becomes apparent that there is far more going on up there than we ever dreamed about. I think it would need to be updated on a regular basis to be kept current. I further realize that most of the really unusual stuff is up there and gone before it could be reported but there are patterns to some of it; for example Western Union Video from LNA to Chicago on COMSTAR D3 of all places!"

Lynn further volunteers to be the 'compiler' of the data and if he compiles it after you send it to him we'll publish it here in the Digest. And that's why we pass along his address.

For most viewers SATCOM FI pretty well takes up your time. When you have twenty-plus video services to choose from you probably don't think you need anymore! But then along comes something such as the Ali-Holmes fight (see last page of this section, this issue) and you begin to realize that not everything is indeed on FI. Down here in the islands I've been locked up on either WESTAR I or III now for nearly two months and I can tell you that between the two there is more television than you can ever possibly watch. I caught the first uplinked movie of the new Gene Autry service on WI back on September 30th and the first night when they sent the Oklahoma City uplink feed from Autry's new KAUT (channel 43) out ahead of the movie feed. You cannot describe the excitement we felt watching Oklahoma City television via Westar I down here in the islands! I see Canadian DEF feeds going who knows where weekdays at 4:45 eastern on WI (using PBS Boston facilities) and Canadian football games for the Canadian independent network on weekends on WI and WIII. I could fill the next two pages just telling you things that I run across constantly (as Lynn says, in a 'pattern') on WI and WIII. I have become a walking textbook of WI and WIII because those are for the moment 'my two birds'. (FI being out of reach with the present 11 foot antenna).

When we get done down here with our antenna work several antennas will be motorized and those that won't be will be capable of **rapid** hand-power movement to adjacent birds. I know now that anyone who limits themselves to a single, convenient bird such as FI is missing a tremendous amount of action. I also know now that to keep up with it Lynn will need a small computer to store the data and to search for 'patterns' in uplinking. Steve Gibson got started in this direction back last spring (he also has the computer ability) but his recent house-move shut him down for awhile. I trust there are others out there who will be willing to share this data. I know for a fact that there are many others collecting it; everytime I talk with Bob Behar on the telephone he unloads a long list of recently seen material on me and most of it is new to me since he plays with a different set of birds than most people.

This issue discusses (in the Technical Section) one approach to the motorized (polar) mount system. There is a big market here for the inventive chap tinkering around in his garage workshop this winter. A really first class mount would be very lightweight and strong. It would go together with hand tools, quickly, and simply. It would handle any reasonable dish up to 16 feet in size and track all of the birds from horizon to horizon. It should be capable of continuous scan and bird to bird programmed movements. It should be capable of being boxed up small enough that it will fit onto a single 'international shipping pallet'. But most of all it must be reliable in all weather and priced (are you ready?) under \$500 (\$499.95 is OK. **You create one** and bring it to **CSD**. We'll get you lots of publicity and orders and you'll be off and running with a nice new business. The rest of us will get a whole lot more; freedom from being clamped onto a single bird that more and more is starting to look like an extension of the three major US networks!

CSD

PROGRAMMING



COOP'S SATELLITE DIGEST (Programming Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (STT). Editorial offices located at West Indies Video, Grace Bay, Providenciales, Turks & Caicos, BWI. Communication with editorial office is through Business Office at P. O. Box G, Arcadia, OK 73007 (405-396-2574); Rick Schneringer, Manager. Photography, Kevin Paul Cooper; editorial assistance Tasha Anne Cooper. STT produces various manuals, videotapes, guides and texts plus conducts the twice annual SPTS and once-annual SBOC events. STT is not affiliated with any manufacturer or distributor of satellite communications equipment. **CSD** subscription \$50 per year US / Canada / Mexico; \$75 elsewhere. Total contents copyright 1980 STT, USA & Turks and Caicos.

TVRO RECEIVER UPDATE

GOOD AND BAD

Last year about this time there was no difficulty determining what type of TVRO receiver you might have in your home or sell to your customers; virtually the **only** receivers being shipped were coming from the 'commercial' manufacturers and Microdyne was a clear leader in the **home** terminal field. The AVCOM 'home receiver' and the ICM 4200 'home receiver' first seen at SPTS '79 were just starting to trickle out the door and while you might favor the lower price of the ICM 4200 or the one-on-one attitude of dealing with AVCOM, if you needed a receiver in a hurry, you went into the commercial marketplace. Well, all of that has changed. But not suddenly and not without some way-stops along the way.

By the time spring had sprung there were other choices available to the buyer or retailer. Several additional 'new' private terminal receivers were on the market and while delivery had not become 'off-the-shelf' by any means at least product was being delivered by ICM and AVCOM with Ramsey and others starting to trickle units out the door. Which brought us to San Jose and SPTS '80 where several new receivers appeared on display and the established ICM and AVCOM receiver lines underwent some surgery. AVCOM decided to add remote tuning capabilities to their radio and ICM was determined not to allow John Ramsey to undercut them in the marketplace with a \$995 receiver. As readers are aware, not everyone likes the performance of the \$995 breed radios. We heard numerous people **say** that the ICM 4200 radio (the original International unit) was far better than the new 4300 and in spite of our approval of the Sat-tec R2 receiver there have been many people who found it also lacking. Past months have dealt with the R2 problems as we uncovered them.

Receiver buyers are understandably confused. Is, for example, the \$995 radio just 'too cheap' to be satisfactory or is there more to it than that? We have spent the past sixty days trying to determine just where the truth really is since we as an industry have a lot riding on the success or failure of these low-end priced units. This is **our report** on where **we think** the receiver folks are today with their product and their manufacturing capabilities.

At the risk of belaboring the subject, virtually all of the high-dollar commercial radios convert the satellite TV energy into picture (and sound) with a device called a discriminator. People with a technical background know the discriminator is a broad term for an FM 'detector'; simply a system of extracting modulation (picture and/or sound) from a carrier. A 'discriminator' is typically a 'passive' device; a system of tuned circuits designed to detect the modulation. There are dozens of discriminator circuits about; some are not suitable for video, and of those that are, most have been refined by the commercial high-dollar receiver suppliers to produce exceedingly high quality color. But a discriminator is not a very **sensitive** detector circuit; at least not when modified for 'wideband' video. Which brings us to the PLL circuit.

English TVRO experimenter Steve Birkill was apparently the first to determine that you could design a more sensitive 'detector' with an **active** device called a phase locked loop

(PLL). For his applications, tied to an 8 foot dish in England and watching (after a fashion) 22-26 dBW EIRP contour signals from INTELSAT, the PLL had several advantages. Birkill worked out a technique for compressing the bandwidth of the PLL detection system; a method of bringing at least watchable **black and white** pictures off of his 8 foot dish when the best commercial receivers wouldn't give you even a hint that video was present. Other US experimenters, notably Taylor Howard, determined that with some more playing about the PLL could recover color reasonably well provided you hit it with enough signal. But the best PLL detector would never, it was felt, produce **superb** quality color; such as that one sees with a Microwave Associates or Microdyne receiver.

So there was a trade; a PLL was more sensitive but it also produced a lower quality picture. How can that be? Well, if the signal is weak (below what is called 'FM threshold') the PLL is **the receiver** to have tied to the antenna and LNA. PLL pictures will **look** better, with **weak** level signals, than conventional discriminators. Then along came Clyde Washburn and his Washburn receiver which rattled some cages. Washburn's receiver made claims that it was 'a sensitive PLL receiver with the **high quality color** of a conventional discriminator'. Many engineers thought Clyde was inhaling funny tobacco smoke and dismissed his statements. When Washburn failed thorough his distributor to deliver kits and parts and modules through the spring and summer (a problem **now** rectified) the importance of his work was lost in the rush of other new receiver technology. However, it later turned out that Washburn was right. A few talented receiver builders, notably Lynn Hurd of Beaverton, Oregon for example, found the Washburn PLL detector system did everything Clyde claimed and perhaps more. At SPTS '80 in San Jose Washburn's receiver demonstrated just how good PLL color could be although his then-inability to deliver probably overshadowed the actual performance of the unit.

Washburn's secret, if you can call it a secret (he has preached it at every opportunity and all you have to do to learn from him is to listen), was extreme care and patience with the construction, alignment and test of each unit. Hurd found that if you work carefully with the system it is capable of producing true broadcast quality color when all other detector schemes are producing noise, torn and ragged edges on sharply defined colors, and black (or white or both) sets of sparklies.

While Washburn was having a painful summer, John Ramsey at Sat-tec and Royden Freeland at ICM were having their own problems. Ramsey's early R2 receivers had a certain amount of the PLL color sharpness plague and people either loved or hated them. There were some little problems as well; in shipping, when roughly handled, the power transformer had a tendency to rip off the circuit board. If it got **loose** inside the receiver it could tear out several important circuits while rattling around. Some users reported heat problems and others said the pictures just didn't **look** good. On the opposite side of the coin those who got 'good units' loved them, carried them around without ill effects and were delighted with the compact size and reasonably good performance.

Royden Freeland was having similar problems. The \$1995 price on the 4200 receiver satisfied a market demand through the winter and spring. This receiver was conceived and designed by H. Paul Shuch (Microcomm) and it followed Paul's 'modular' approach. Royden likes the modular approach feeling that it is far easier to upgrade or even manufacture a receiver in modular-pieces than it is to build everything on **one** circuit board as Ramsey does with the R2. But the new 4300, priced at \$995, introduced at San Jose's SPTS was a rather large jump for ICM. The market was expanding and where 4200's went together in 25 and 50 lot groups the 4300 was designed for 100 + lot groups. Many things internal to the receiver had to be changed from the 4200 to make larger mass production techniques in the 4300 play.

While ICM and Sat-tec were adjusting to their own new production problems along came another technique that begged attention. Like so many things in this field, it apparently started with Tay Howard and some friends. The detector (or PLL circuit) was the object of attack.

One of the inherent limiting factors in PLL performance is the frequency at which the PLL operates. They are designed to

detect or demodulate video from the satellite receiver's IF (intermediate frequency range). Most receivers utilize 70 MHz as a 'standard low IF'. Why? Well, because that is the way the telephone companies built receivers at Western Electric back in the late 40's and 50's and from that day forward virtually every microwave video receiver manufactured has followed the 70 MHz IF format. John Ramsey didn't. The R2 receiver, for example, has a 60 MHz IF. John rationalized that if a PLL had difficulty working, sometimes, at 70 MHz, it should be easier to make operate 'down' a little; say 60 MHz. Royden Freeland stuck with the 70 MHz IF but will be quick to tell you that as you go through the receiver alignment business you can often see vast differences in performance between one demodulator 'module' and another. And these differences can be traced directly to the PLL device plugged into the board. You get a module that won't produce good quality color, you can often make a world of difference by pulling out one 564 PLL and sticking in another. In a nutshell, 'pushing' a PLL as a video demodulator to the standard 70 MHz is risky. **Lowering** the frequency at which the PLL works is one way to make it work better or at least one way to insure that more of them worked at all.

Enter now Tay Howard and his 'trick detector'. Tay decided that perhaps Steve Birkill's original 35 MHz IF had something after all; although for channel separation reasons there was no way the American 24 channel satellite receiver could use an IF 'that low'. Still, Birkill obviously was having better luck (or getting better performance) with his standard 564 PLL demodulators than say his American cohorts. How do you get a satellite TV IF down to say 30 to 35 MHz without really going there?

Howard did it first but John Ramsey was close behind. **You divide** the FM IF signal by two (as in cut in half) with something called ECL circuitry. Then you take the output of the divider and drive your PLL detector at **1/2 the normal frequency**. By mid-September divide-by-two was under test at ICM and Sat-tec was already shipping it.

We saw our first working divide-by-two receiver, a Sat-tec R2A, only days after Ramsey got his first proto-type running. We happened to be in Oklahoma at the time and since we were scheduled to visit with Royden Freeland and pick up a 4300 receiver for test (see separate report in this CSD) we took Ramsey's R2A down to ICM for some side by side testing.

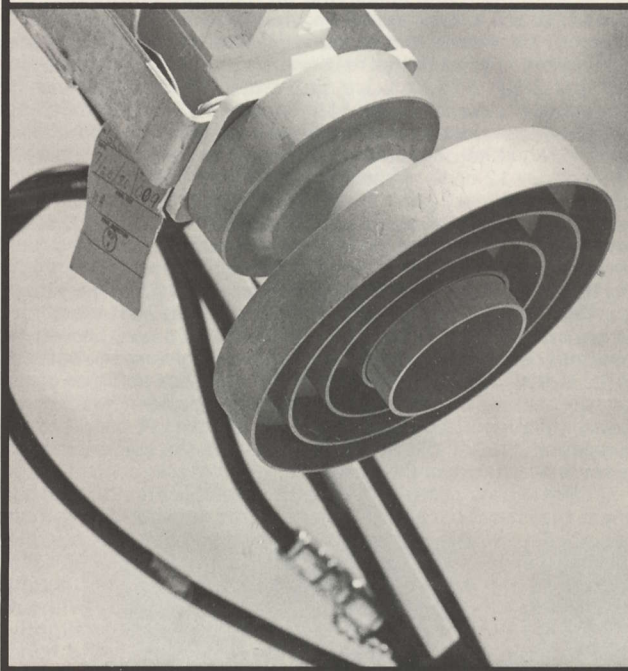
In the Sat-tec receiver the divide-by-two approach fits onto a small sub-board that tacks onto the receiver 'mother board'. Royden and I agreed the results were impressive (ICM could afford to be open with their admiration of the approach's results since Tay Howard was working with ICM on adding the same modification to the 4300 series receivers). Actual receiver **sensitivity** was either the same or slightly better. Most apparent was the lack of color tearing on sharply defined color images. Lettering, 'supered' on the screen over the top of a scene, no longer hissed and roared in the audio line nor did it 'rip' to the right with jagged trailing edges. Since this has always been one of the more objectionable 'side effects' of PLL demodulators, score one for Ramsey.

"I feel that we should offer to anyone with an R2 receiver the opportunity to upgrade their receiver to an R2A" offered John Ramsey. "Yes, the divide-by-two approach to the PLL **does make** quite a difference in the picture quality and if present owners of the R2 will return them to the factory **we will upgrade them at no charge**". Score another one for Ramsey.

While visiting at ICM we had the opportunity to view the performance on a number of TV4300 units, an older TV4200 as well as the R2A and the SATRX unit first seen in San Jose. We learned something here.

"One of our biggest problems in producing **exactly identical** TVRO receivers is the inconsistency of microwave parts" commented Royden. What happens, we wondered? "Well, there are wide variations in operating specifications within a batch of supposedly identical parts from the same supplier. And between batches... well, the differences are even larger". So here we have supposedly high tolerance parts, purchased from reputable microwave suppliers and priced accordingly with such widely varying specifications that receiver performance also varies. We saw this as we watched the alignment procedure on receivers.

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"We have standards of manufacture of course and there are bins filled with receiver modules which don't meet those standards. That's one of the reasons I like the modular approach; we test and align in segments and if a segment doesn't make the specified performance we don't use it".

Still, even if every receiver shipped meets standard performance, some meet it 'better' than others. "Yes, there are 'hot' receivers in the field right now. Some just work better than others and there is no denying that". Is this peculiar to ICM? "No, not at all; I believe you will find it with even the commercial high-dollar receivers".

Performance may even be hot in a portion of the 'band' and only par (or perhaps below) in other parts of the 'band'. We saw one 4300 on the bench that produced outstanding pictures on the lower transponders, not so hot on the high end. "After alignment and specifying all receivers are thoroughly burned in on a test stand and then checked again before shipment" Freeland added. As we talked one receiver on the bench seemed to be hotter than any we had seen in production test that afternoon. A voice spoke up. "Coop's receiver is checked out". We had brought back from the Turks and Caicos a 4300 which worked reasonably well on the high end of the band but which sometimes did not work at all below transponder 12 or so. Freeland asked how well the repaired unit worked. "Very good" was the response. "As well as that one" Freeland asked, pointing at the hot receiver we had noted on the bench? "No, not quite" was the response. "Give him the hot one" directed Freeland and within minutes I was on my way headed back to the islands with a super hot 4300 in my bag.

The 4300 was well wrapped in air-bubbles so it went into my suitcase. The R2A Ramsey had sent down was packed in some soft clothing and it went into my carry-on bag. I wouldn't let it out of my sight or hands all of the way back to Provo. Also coming back with me, slightly delayed because it went as unaccompanied baggage, was a factory re-conditioned Microdyne 1100 TVR; an early victim of the uncertain AC power line voltages in the islands.

"Remember that while no receivers leave the factory unless they meet our specifications, some do work better than others". Freeland's words rang in our ears as we hooked up his 4300 back on Provo. These were the finest pictures we had seen off of our 11 foot ADM dish parked on WESTAR. And although the receiver was still using a stock PLL demodulator without the 'divide by two' system the color tearing was only slightly objectionable. Next we hooked up the hand packed and hand carried R2A receiver. After several minutes of fumbling we decided that something was grossly wrong. The pictures were noise-filled and although the color was outstanding we couldn't watch the video through the snow storm. OK - bring out the re-conditioned Microdyne. It worked just like it did before the local power system zapped two power supplies and we had to return it to the states for repair. Unfortunately for Microdyne, 'as well as it did before...' was obviously **worse than** the 4300 receiver. Once again the proof of the PLL system; **given a below threshold picture**, the PLL simply works **better than** conventional discriminators.

We spent the next several days, on and off when other duties allowed, poking around in the R2A. We had given it a several hour workout at the Lab site in Oklahoma plus used it while visiting ICM. Something had happened in transit. "There are shipping problems" John Ramsey had told us. "Units don't always arrive aligned as they left the factory" agreed Royden Freeland. Who's fault was it? Inadequate packing?

"No question we have to learn how to package better" suggested Ramsey. "But most of all, as long as each radio has to be hand tweaked for peak performance and the microwave parts that determine performance vary so much within their own specifications there are simply very-very tight alignment tuning ranges to work in" noted Freeland.

Faced with a minimum of two weeks of loss while the R2A would have to be 'smuggled' back into the states for repair and then eventual return we decided to try a hand at alignment of the mal-functioning receiver ourselves. The next plane for the states that could carry it wouldn't leave for two days so no time would be lost by trying.

After perhaps four hours of fiddling, during which **we did**

make a considerable improvement in the picture (but still far below the performance we had seen side by side against the 4300 in Oklahoma) we buttoned it up and sent it into the stateside chain. The experience taught us that with the R2A, at least, **exceedingly small adjustments** on sub-miniature voltage controlling pots and slug tuned forms make fantastic differences in receiver performance. A 1/32nd turn on a form took the picture from best to gone. It was no longer any wonder to us that receivers could end up in Oshkosh not working right. In fact, it was something of a wonder that any of them ever end up where they are headed still working **at all** and that is the message you should file away.

"The experience at ICM has been that when parts are not close to their own design values, all tuning becomes critical in that area" Freeland had noted. In fact tight, erratic tuning is itself a 'red flag' that some often major component part is not operating as its manufacturer had intended. And when you marry a couple of parts into the same circuit and **both** are out of tolerance in the same 'direction' (such as both being off in a negative direction) you compound the problem.

Hummm?

Receivers are growing up. The manufacturers are learning more about them all of the time and much of what they are learning is being shared at both ends; to the users and to the chaps who supply our manufacturers with those blasted microwave parts.

There are a pair of critical microwave parts still with us. The high frequency voltage controlled oscillator (VCO) that does the tuning and conversion of the 3.7 to 4.2 GHz signal down to a high IF is one. Another is the double balanced mixer. The Sat-tec R2A has done away with the heretofore popular VARIL DBM-500 mixer; Ramsey found delivery too erratic to suit him and subsequently designed his own mixer. ICM still uses these usually high quality sub-modules.

NOW - what about those other receivers we saw at San Jose but about which we have heard very little subsequently? Let's do a quick look at each.

- 1) The **Taylor Howard** receiver designed for Canadian firm **Satellite Supplies** has undergone some major re-designing since its intended debut at San Jose. A 'test' run of 100 receivers was to have been completed during October and word was that initial marketing would be in Canada alone. You can find out more from J.R. Walsh at (604)859-6315. If you are technically motivated, you'll be surprised how much this receiver has changed from the April-June announcements from Howard.
- 2) The **SATRX** receiver introduced at San Jose had an initial production run of 20. It was first rumored to be ready for production in the Far East, then Australia. The 'truth' is this receiver was designed by a well known person **for production in the Far East** for exclusive sale **in Australia**. By some strange happenings the receiver has ended up in the US where it is apparently going to be mass produced (mass is a relative word; 50 per month to start) by another well known TVRO supplier on a job-shop basis. Meanwhile in Australia the new **INTELSAT** spot beam service this receiver was intended for is up and running and apparently the receiver shown in San Jose is not going to be available down under for the time being. This receiver seems to work very well but **CSD** has yet to get our hands on one for any exhaustive testing. It looks promising...but...
- 3) The **Washburn Receiver** has had its problems. Clyde Washburn and his original manufacturer, John Ramsey, of Sat-tec, had their difficulties and 'split' officially on July 1st. Only a handful of wired and tested units got out the door prior to the problems and most of them bounced back. Clyde spent the summer putting the pieces back together and finally teamed up with a well known, national microwave firm that is riding high on the success of another consumer microwave product these days. Clyde is on the project full time and appears to have the financial and marketing backing of a good company. **But the real proof is shipment of the product.** Washburn was having his problems with parts delivery in mid-September but felt he would be shipping kits (perhaps 25 in the first batch) in mid-October and wired

and tested units (perhaps 50 first month) by November. He dropped the wired and tested price to around \$2,000 (earlier list near \$3,000) and developed a comprehensive parts and pricing schedule. They have also decided to adopt an 'open' marketing program wherein anyone who **qualifies** as a dealer gets a dealer discount **regardless of initial quantity purchased**. You can find out more by calling Clyde Washburn at 716-223-7457.

- 4) **John Rohner's** amazing \$1500 receiver plus LNA created quite a buzz when it was first announced in May. By the San Jose SPTS Rohner was riding a crest of publicity and interest. Unfortunately his receiver was not ready to show in San Jose and by mid-September there were dozens if not hundreds of concerned folks about the country side wondering about the young man from Iowa. The last **official** word we heard was that John was tied up awaiting some aluminum castings. However several people who have managed to get through to him on the telephone subsequently advise that John's problems **may be** much more severe than not having castings. He asked **CSD** to repeat his full page, color advertisement in October with a change; **jack the price from \$1500 to \$2500**. With so many questions around about the true status of the receiver we declined to run the ad and our policy at the moment is to wait to see a real, live Rohner receiver in our Lab before we accept additional advertising.
- 5) Andy Hatfield's **AVCOM** receiver line continues to sell well and the waiting line is fairly long (typically over a month). Andy builds a quality product but for some of the aggressive retailers he builds too few of them. Andy **insists** on putting each receiver through an elaborate check out procedure and believes that he is building all he can without sacrificing quality. With so many receivers having field problems Andy may be on track.
- 6) **Comm-Plus** from Montreal (514-337-7255) left San Jose with very high interest in their extraordinarily beautiful receiver that frankly didn't work that well in San Jose.

Their unit was adopted for a football game by the baggage handlers between Montreal and San Jose and arrived at SPTS crushed and broken. It did work but not like their builders said it should work. Unlike the American receiver suppliers, this Canadian firm started out deciding that they would not use any 'standard' microwave parts. The double balanced mixer and the SHF VCO that many suppliers wait in line to get to build TVRO receivers are of Comm-Plex design. They say this will insure that **when** the production lines get moving they will not be held up by slow microwave parts delivery. **A big splash is planned for Houston...** but again, the proof will be delivery of a reliable product. Their \$1995 Canadian price is hefty but American dealers can expect a healthy discount; bigger than most US suppliers offer.

There were three other receivers shown for the first time in San Jose. The **ICON** dual-receiver attracted some interest and we understand it is doing well in Canada but delivery is not strong. The **TCI** (Telemetry Communications & Instrumentation Corp.) receiver looked good in San Jose but efforts to get one for test at **CSD** have not borne fruit to date. And the **Coleman 3742** receiver displayed by **H&R** seems to be tied up in some production and delivery problems.

Like any brand new field the firms with some strength because they have other product lines seem to be making the most noise and ultimately will have the best potential to deliver productions **in quantity**. **AVCOM** is a good example of what an enterprising "small business" chap can do if he keeps his promises in line with his known abilities. Andy Hatfield has had several good offers to go 'big time' but prefers to turn out a modest number of high quality, reliable radios each month. Others **could** do the same thing but we've all been in this long enough now to recognize that 'performance' soon catches up with 'hype'. **There will be** other, new radios; from both established firms and new guys on the block. Some will make it and we'll all be pleased they did since the industry continues to need several times as much receiver product as we are getting. And that's the bottom line.

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BRINGING TV TO A NEW COUNTRY [Part I]

BE PREPARED

Bringing television or modern telecommunications to a forgotten spot on the globe is not a project for the light hearted. Fortunately I carried no illusions about the challenge before I began or the first several weeks in the Turks and Caicos might have sent me packing back to the ease and comfort of the 'States'.

It is very difficult to describe the isolation of an island that is served by no regularly scheduled airline, has no established mail delivery service and has so few fulltime residents that virtually all of the established streams of commerce ignore its presence on earth. A companion to isolation is frustration; the frustration that goes with half completed projects set aside for lack of a key part or the frustration that comes from depending upon other islanders who readily agree to help you solve a problem when in truth they are perhaps less qualified to assist than you yourself.

"No problem" is the standard enthusiastic answer to a query. 'I need a sheet of 5/8th Marine plywood to mount the 11 foot ADM antenna on' said I. "No problem". 'Can I get a telephone?' I asked. "No problem". 'The power plant is allowing the 60 Hertz AC to wander well above 61 hertz; can we bring it down?' "No problem".

Because we had spent several years planning both the move to Provo and the fabric of the television and radio station chain we left Oklahoma reasonably confident that we could control our destiny on Provo for at least a few months. Alas this was not to be. The videotaping done by STT on a regular basis in Oklahoma stayed in operation up to three days before we left for the Caribbean. At the last minute Gary Wilhoite, Rick Schneringer and I stripped nearly 4,000 pounds of video gear out of the Oklahoma production room and packed it into shipping crates, trunks and heavy Sony cartons. Carefully pre-arranged shipping plans followed. By Emery to Miami, a transfer to something called Turks Air and delivery then on Providenciales only days later. More than a week later the 4,000 pound shipment was lodged in the gut of Turks Air back in Miami. First Emery failed on their promise to make overnight delivery to Turks Air and then as a result of this we lost our spot on Turks. The next Turks shipment was filled with school desks and other high cubic materials that popped up at the last minute bumping us back again.

Meanwhile on Provo the 'August boat' from Dania, Florida was overdue. On it was around 9,000 pounds of additional supplies for the broadcasting center plus the Cooper family. Scheduled to be on it was a special galvanized 20 foot trailer I had designed and ordered in Miami; a trailer to initially haul the air and water cargo from their points of island arrival to our temporary headquarters. Later the trailer would be outfitted with an 11 foot ADM antenna which would be carried about the islands on a small barge for instant satellite TV. "No problem...the boat will be here any day" I was told.

We lost a week. And we swam a lot and generally acted like tourists and chased some loose ends that had developed elsewhere. First and foremost of these was our license from the Turks and Caicos government to operate the television and



FIRST IN THE COUNTRY - Ed Ewing assembles 11 foot ADM antenna on the white sands of Provo.

radio station chains. "No problem" I was told. 'When?' I asked. "No problem". Another 'no-problem' problem was a 1980 Chevrolet Blazer four wheel drive vehicle I had painstakingly outfitted in Oklahoma City back in June, had driven to Dania, Florida for water shipment in July and which now sat in semi-advanced stages of salt water spray and coral sand rust decay on Provo. "You should have had it undercoated" I was told. 'Undercoated!' I held in my hand a multi-hundred dollar receipt for triple undercoating paid to an Edmond, Oklahoma Chevrolet dealer. Alas, the Blazer work was to have been completed while we were in San Jose attending the SPTS event and there had been no way to perform a final inspection of the work ordered. Not only was the undercoating not completed, minor surgery on the vehicle's emission control system (removing same since air pollution is not a problem in the Turks and Caicos and unleaded gasoline does not exist), completion on a 6 ton front end winch, installation of various communication antenna mounts and special coatings for the outside painted surfaces and the inside fabric surfaces was also not done.

"Getting the emission control junk off there is no problem" I was told. This time he was right. The island had been out of gasoline for two weeks prior to our arrival and according to reports we heard the boat captain for the Shell Oil operated boat that plys the southern Bahamas and Turks and Caicos group was locked up in a jail in Miami because he made the mistake of rescuing a raft full of Haitians he happened across on the open sea. The American authorities charged him with aiding and abetting illegal immigrants to the US.

Being out of petrol is a serious problem. Car and truck pooling is common place anyhow but now one sees dozens of people hanging on every available surface of the vehicles still running. With a construction boom underway, petrol to run trucks, cement mixers, portable power generators and the like becomes a precious, protected commodity. Other aspects of the island's economy, dependent upon the supply of fuel, shut down completely. The main export from Provo is shell fish (lobster, conch) and multiple types of scale fish. It amounts to more than several million dollars per year. Hundreds of Provo based fishing boats ply the reefs that 'band' around the islands daily from August 1st through April 1st. These two or three man rigs operate independently of each other but together they bring in some substantial catches. Without gasoline to run their outboards no fishing is done.

Back on the July boat along with the semi-completed Blazer we had sent down an 11 foot ADM antenna. We had no illusions about the effectiveness of this rig in an area where quality FI pictures took 20 foot dishes but we felt that the higher signal levels from WESTAR I and III and possibly higher signal levels on selected D2 and D3 transponders might make such an antenna play. Several days after James Gowen had shipped the 11 footer to Dania's dock he called to advise me that the panels with the antenna were likely to be out of

tolerance. He was shipping a second set and he suggested that we **not** attempt assembly of the first set since the pieces went together with difficulty. We tried anyhow while awaiting an overdue boat and an overdue airplane. **James was right**; and after Edmond and I spent the better part of a day in the blazing sun trying to wrestle the 24 pie shaped pieces into position we set it all aside to await the boat.

The arrival to the Turks Air Cargo brought life back to the operation. No more laying around the beach, snorkeling and fishing for us. From that point on all time had to be carefully measured and parceled out. Transporting the 4,000 plus pounds from the air strip to our headquarters was the first task. With gasoline supplies exhausted and five miles of terrain to cover it looked like a long trek. A minor obstacle was getting through the customs folks. The huge pile on the runway, some 15 foot square and perhaps six feet high, of boxes and crates and trunks could not be hidden! Now **part** of our formal application to construct the TV and radio stations called for us to bring in **all** of the materials we needed **duty free**. With import duties of 25% this was no insignificant potential 'tax'. In fact without that assist from the government there was no way to bring TV to the islands. Alas formal final approval had not yet come and the customs people were understandably edgy about our removing the mountain of merchandise off of the runway without that approval. We worked it out and even bartered for enough petrol to get us from the airport to our facility **provided** we could lodge everything we had on two pickup trucks. The folks at Sony missed a golden opportunity. Dozens of heavy duty containers marked 'SONY' piled high above two ancient pickup trucks well rotted from coral sand

and salt spray bumping along a trail lined with palm trees and white sand. And me without a camera!

While still up to my eyeballs in unpacking and re-assembly of the video production and duplication system the long overdue boat arrived. On board was a wide variety of much needed materials including the shelving and tables for the video production system and of course 24 replacement panels for the ADM antenna. Fortunately the gasoline boat arrived at about the same time and that put the island's transportation system back into operation.

Within 12 hours of arrival the video production center was at least functioning in the playback mode. That may sound like a long period of time to get a monitor hooked up to a playback deck and it is. In that 12 hours we learned several things about the island power system we didn't want to know.

It is a common practice to power a small community such as this from diesel generators. Our Provo generator system uses a pair of units; one of 150 kW and a second of 900 kW. Both were originally manufactured by Caterpillar. Typical diesel generator specs include 60 hertz AC $\pm 3\%$. The voltage levels are set and maintained by external equipment. **"We have a problem with the 60 hertz regulation"** confided the manager of the power cooperative. **"It wants to drift upwards so we set it twice per day in the 59 hertz region and it simply drifts up to 60 hertz or so before we set it again"**.

Humm. Lacking a hertz per second meter there were several options open. The simplest way of measuring over time would be to calculate how slow (or fast) a digital clock runs since all electric clocks depend upon the 60 hertz waveform for their timing base. If the clock ran 1 minute per hour slow, that



FIRST LIVE SATELLITE TV came through this 11 foot ADM antenna. First we simply set the base on the sand. Then we got smarter and made an 8 foot by 8 foot square out of 3/4" plywood to bolt the antenna base down. To make it rigid at first we piled up cement blocks and stones under the lower lip but later graduated to a sliding stabilizer bar front and rear.



ANTENNA ERECTION - Temporary WIV-TV antenna is five element yagi near top of mast. Other antennas for two-way VHF communications; Edmond adjusts coax line down boom.

works out to 59 hertz (1 hertz loss per cycle equals 1 second per minute lost).

Videotape machines also reference the same 60 hertz rate for any number of high tolerance motor drives and the all important time base. With 3/4 inch tape gear and both of the 1/2 inch formats on hand we quickly discovered that the 3/4 inch gear was tolerant of AC line variations of just under +1-2 hertz; 1.8 hertz each way to be exact. The VHS gear is not quite as tolerant; +1-1.5 hertz seems normal. **The BETA gear is far less tolerant;** +1-1/2 hertz seems to be about all it can handle before a noise bar rolls through the video.

"**And here I have been blaming the tapes**" commented a resident with a BETA machine. "One day they worked - the next day the picture had all of that static in it". Well, controlling the 60 hertz waveform had high priority since the old Caterpillar diesel generators could not be expected to maintain the accuracy on their own. In talking the problem over with **AB Electronics' Bob Behar** he recalled how back in his TV broadcasting days a similar problem with ENG units was resolved with a **DC TO AC Sine Wave Inverter**. It turns out that frequency stability of +1-1/2 hertz is typical with such machines. So all a person needs is an AC source in the 115 to 130 volt range to drive a 12-14 volt DC supply, and then reconvert back to sine wave AC with the special inverter. The option was not too attractive; sit around and wait for the local power company to 'drift' into a window between 59.5 and 60.5 hertz and then do the tape duplication work!

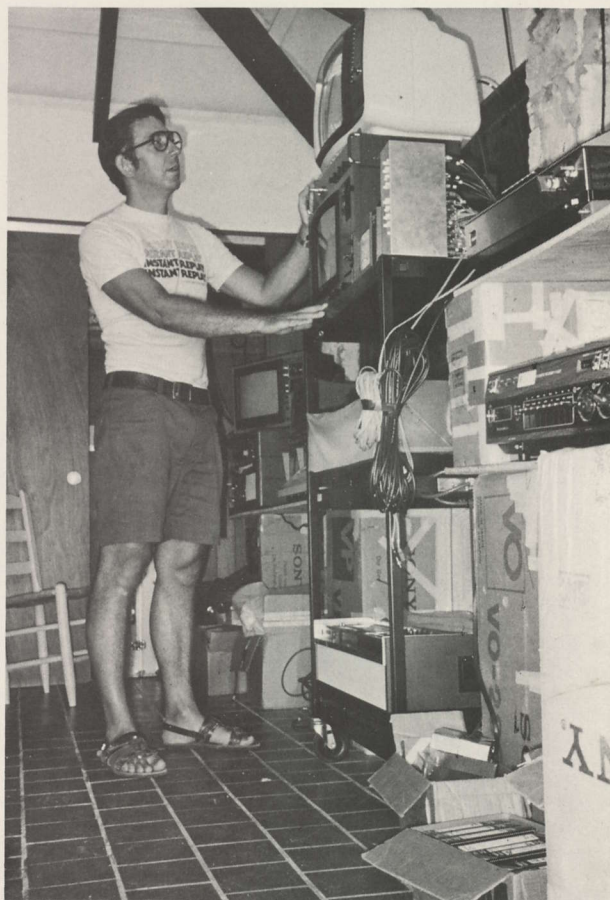
A solution to the tape production problem worked out efforts turned to getting the satellite terminal up and running. Edmond Ewing wasted no time tackling the new panels from ADM. "**A piece of cake!**" he exclaimed as panel after panel laid into position. Sitting some 650 miles southeast of Miami

we had no illusions about the pulling power of an 11 foot antenna (even if equipped with the Caparral feed). SPTS Miami attendees from the Bahamas and the Dominican Republic had pretty well zeroed in on what we should expect. After the Miami event several antennas in the 11 to 16 foot class had gone in on **both sides** of the Turks and Caicos and the results were convincing. WESTAR I and III signals would be near FM threshold as would a handful of transponders on COMSTAR D2 and D3. SATCOM FI would be 'in the mud'.

The first live television ever seen in the Turks and Caicos was a baseball game from WESTAR III. But it took some looking to find it. First a Sony monitor earmarked for the satellite package come out of the shipping crate broken. The little Sat-tec R2 receiver suffered a similar fate; during shipping the power transformer had ripped off of the circuit board and floating around inside of the plastic case it had a field day wiping out circuitry. A brand new ICM TV-4300 receiver didn't act right; even with no signal input. The receiver monitor screen lost all signs of 'noise' (snow) **below** the middle dial channels suggesting the VCO was only operating on the high frequency end of the band. And a 100 degree LNA that was packed and floated in a bed of plastic 'peanuts' simply did not play as it came out of the box.

We were understandably nervous that from a starting position of three TVRO receivers we had lost two **before** the first signal was found! The Microdyne 1100-TVR, freshly back from the factory just before we left Oklahoma, did work however and with it the first live TV came to the islands.

Word that live television was being received from satellite spread fast and our formal application for the coveted telecasting licenses suddenly became dis-lodged from the government system. "**If you will fly over to Grand Turk on**



58 HERTZ! Makeshift benches created from empty Sony boxes housed the video production center gear in a corner of young Kevin's bedroom during first month of operation.



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ET/3.66 (12 foot) Antenna Gain = 41.1 dBi, which means that the following satellite "EIRP minimums" are achieved:

Required		EIRP Minimum [dBw]	
CNR	SNR	w/120°K	w/100°K
(dB)	(dB)	LNA	LNA
8.0	46.6	32.0	31.4
9.0	47.6	33.0	32.4
10.0	48.6	34.0	33.4
12.0	50.6	36.0	35.4

ET/4.85 (15.9 foot) Antenna Gain = 43.5 dBi, which means that the following satellite "EIRP minimums" are achieved:

Required		EIRP Minimum [dBw]	
CNR	SNR	w/120°K	w/100°K
(dB)	(dB)	LNA	LNA
8.0	46.6	29.6	29.0
9.0	47.6	30.6	30.0
10.0	48.6	31.6	31.0
12.0	50.6	33.6	33.0



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NOTE: The presence of numerous subcarriers on some satellite transponders can raise the EIRP minimums 1.5 to 2 dB.

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Wednesday there will be a meeting of The Council to address your application". We put together a hastily prepared 3/4 inch videotape showing the progress to date and hopped aboard a two engine plane headed in that general direction. Because of the uncertainty of when we would actually show up on Grand Turk the Council meeting wasn't convened until we arrived on the island. Sixty minutes later it was history; full licensing for both our television system (three channels on three islands initially) and for companion stereo FM broadcasting facilities.

Meanwhile the first shot at getting a TV signal on the air was progressing. With the main studio site under construction on the beach and no expectations of being able to move in prior to mid-December, temporary headquarters were going together in our rented beachfront house. Ultimately, after January first, the service would be scrambled; an over the air pay system. On an interim basis while we were getting into the permanent facility a five element channel four yagi was erected a mighty 20 feet above the sand dunes and directed at the center of population to our west. To get on the air, we would loop video from either tapes or the temporary satellite feed through our video production center console and then into a Blonder Tongue CATV modulator. The channel 7 output of the modulator would run into an Anderson Scientific 7 in and 4 out VHF translator to give us ten watts peak pedestal power to the feedline. Combined with the gain of the yagi array we looked for around 100 watts ERP (effective radiated power). With 80% of the island line of sight and within 7 miles that seemed like enough to get us started.

Out of the box the Anderson translator failed to work. Someplace between the channel 7 input and 7 to IF conversion modules we were losing around 30 dB of gain. Our output power was in the neighborhood of 1/10th of a watt on channel 4. The same day we discovered this a switching transient on the AC line blew out the +6 and +15 volt supply lines in the Midrodyne/TVRO receiver. Within minutes another transient demolished a power supply on a freshly unpacked amateur radio transceiver.

Clearly, powering was not going to be a simple task down here! A shipment of heavy duty constant voltage (isolation) transformers was quickly arranged for through Bob Behar in Miami. While awaiting their arrival equipment would be run only for brief periods of time and then when only absolutely necessary. Another visit with the local power mogul resulted only in denials and vague references to our adapting to 'the island way of life'.

The 'island way of life' is fascinating. And we had no illusions about it before making the permanent move. It can be something of a cultural shock however if you step off an airplane fresh from the states.

In our case we love the sea. So we decided to build as close to the water as the local law will allow. That places us about as far from the deep green of the Caribbean as home plate is from the pitcher's mound. There is plenty of warm weather (the median temperature hovers between 78 and 80), although once they tell me many years ago in the dead of winter, it actually



LIVE TV! Contractor Sam Lightbourne, plumber Tom Lightbourne and WIV's Ewing watch Jerry Lewis Labor Day Telethon via WESTAR.

dipped all of the way down to 64 degrees! All four seasons have the same temperatures, typically between 75 and 88 day or night. There is plenty of sand. Susan suggests that you will gain a pound or two after a week here simply by picking up sand in every nook and cranny of your being. If you like seafood, you can eat as much as you wish as often as you wish. Susan stands in three feet of water and with a hand line tossed out into the coral beds catches more than this family of four can eat.

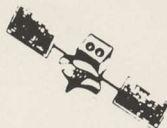
Providenciales is very lightly populated. Perhaps 1200 people now on an island that, were it in the Bahamas, would hold several hundred thousand. That means there is a shortage of skilled, knowledgeable people. We have one capable plumber on the island and one capable electrician (my broadcasting partner Ed Ewing). There is a modest hotel industry (with a maximum sleeping capacity of perhaps 70 people) at the present time; and getting here is a pain in the neck! Air Florida flies from Miami to Grand Turk three days per week (and returns to Miami of course) but then you have to get back from Grand Turk to Provo on TCNA (Turks and Caicos National Airlines); an intriguing collection of British design two engine aircraft that may make as many as five stops between Turk and Provo. There are other ways to get directly from Provo to Florida and return; they involve using private, unscheduled flights of pilots largely based on Provo. Anyway you do it, a round trip is in the \$200-250 region to south Florida.

While there is a modest fresh water table under some parts of Provo the majority of the water required comes from the sky. Each roof has a catchment system that empties into a cistern; a large concrete tank typically under the slab floor of the house. The more it rains, the more water you have available. This has been a wet year on Provo and most cisterns are full. However every bathroom you go into has small signs posted to remind you of the potential for water shortage. 'Shower With A Friend - Conserve Water' is common. One in our bathroom of the present rented facility reads:

**On this Isle of fun and sun...
we don't flush for Number One.**

There is one more thing you don't do...very long. And that is leave your hot water heater on all of the time. Virtually everything is highly priced here; fish, sand and surf being the exception. Gasoline is nearly \$2.50 a gallon, milk \$5.00 a gallon...and then there is electricity. I suspect 34 cents per kilowatt hour is higher than virtually anyplace in the States. And an electric hot water heater that draws a kw of power will run up a \$8.16 bill per day if it runs in the on condition full time. There is a popular local story about the chap who went away for two months leaving his hot water heater running and by accident leaving a hot water tap running. When he came back, so the story goes, the electric company had confiscated his house for the electric bill due.

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THE ICM 4300 TVRO RECEIVER

QUIETLY ELEGANT

When one surveys the TVRO receivers available in the marketplace these days it becomes clear that you are dealing with small firms having their own growing pains. And when the TVRO receiver is itself a new product, and therefore will have its own start-up cycle it is even more painful; for the equipment manufacturer as well as the equipment buyer.

If one traces back to the first 'private home receivers' introduced at SPTS '79 in Oklahoma one sees that ICM (International Crystal Manufacturing Company) was right there with a pioneering product. That product was the ICM 4200 receiver of which many hundreds were built and sold into the field between about this time last fall and the start of summer this year. ICM is, unlike virtually all other firms in this business at the home terminal level, an established firm with a considerable history of expertise and a well established funding base. ICM was founded shortly after the end of World War II when a chap named Freeland, fresh out of the service and with a good electronics background, decided to enter the crystal distributing and manufacturing business. Today ICM is one of the largest commercial manufacturers of quartz crystals for electronics and industry in the world. The firm is housed in a number of low-profile buildings in the heart of Oklahoma City. The senior Freeland died in a private airplane accident a couple of years back and Royden Freeland is now in charge.

Royden Freeland was one of the early visitors at the STT pioneering home satellite terminal site back in 1976; shortly after it was installed. Royden studied the system and then proceeded to install one of his own; the first being a ten foot antenna system with various pieces of commercial gear. It was for his own amusement and education and perhaps in the back



ROYDEN FREELAND [nearest camera] adjusts and checks out a 4300 unit for CSD in the ICM facility in Oklahoma City.

of his mind he also was considering building some part of the system at the ICM facility. If one could accurately track who had private terminals early in this game, Royden Freeland's home terminal had to be in the first 50 or so out there. That makes him a veteran pioneer in this business.

Freeland began his 'serious' interest in building TVRO receivers in the fall of 1978. A chap named Steve Richey (see CSD for June 1980) was starting to build private terminal receivers in Oklahoma about that time and Royden tried to interest Richey in allowing ICM to turn them out. Richey balked at the concept and but for that twist of fate ICM might have preceded others to the market by as much as a year. Between that non-working arrangement in 1978 and the mid-summer of 1979 Royden Freeland made contact with one H. Paul Shuch, the California microwave educator and circuit designer who through his Microcomm firm was starting to design and sell 'modules' for TVRO receivers. Freeland decided Shuch had the closest thing to a working TVRO receiver that could be duplicated on the assembly line (at the time) and arranged under a licensing agreement to assemble and then later actually build the modules which went into the receiver. The 4200 was so born and shown at the first SPTS (79) event.

With a strong corporate foundation Freeland could 'afford' the luxury of not making an instant profit from the TVRO receiver line. Many times he commented "this is a very expensive hobby!" meaning of course that the start up costs in test equipment and personnel were monstrous. Fortunately for the industry his interest never slackened and he kept with the project through both some initial design and production problems and the uncertainty of the market's development.

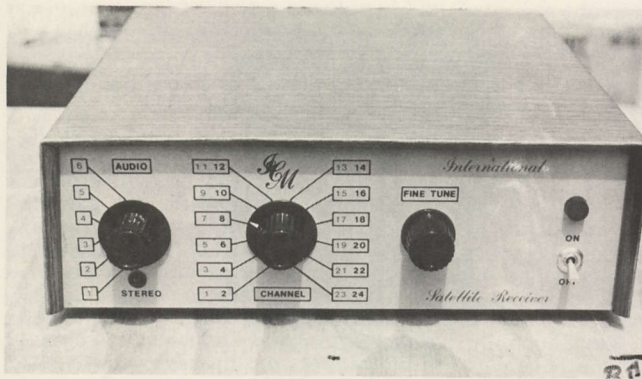
ICM had, in its 30 year or so history, **done things other than build crystals before**. There were amateur radio units and what was probably the world's first high quality CB transceiver back in the early 60's. There was a siege with microwave ovens and other products. In each ICM was early into the marketplace building a product which through time has endured.

The ICM satellite TV facility in Oklahoma City is separate from the main plant. Modules for the receivers are produced in an assembly line area and brought to the special facility which gives its use away only when you note the TVRO antenna adjacent to the building. Inside is a large, still underused well equipped lab where engineers and technicians do final receiver assembly and the laborious task of tweaking and aligning each receiver for peak performance. All units go through initial alignment, a burn-in cycle test and then a final check out. And into the field.

As a companion report on the current state of receiver technology in this issue points out, not all receivers of the same brand and model number are created equal. CSD was delivered a 4300 by Royden Freeland just days before we packed up and headed for the present Caribbean office and lab site. We never plugged the radio in for any extensive testing before leaving because time was too short. When the unit came out of the box on Provo and was turned on it worked but only after a fashion. The reception on the channels below say mid-band (or 12) was either intermittent or non-existent while the upper channels didn't look too hot. So we hauled it back to Oklahoma in mid-September on a return trip.

As the companion report notes, another 4300 was given to us replacing the unit we brought back. On Provo the replacement 4300 has quickly become our standard of comparison unit since it produces the best looking pictures of any receiver we happen to have on hand at the moment.

The 4300 is running under tough conditions here. Our 11 foot ADM antenna, tweaked to the last 1/10th of a dB of gain by hours of careful work, is delivering a picture that is still below threshold on even the 'hot' Westar I and III transponders. Only the very occasional transponder 24 feed on Comstar D3 (to Puerto Rico on Sunday mornings) actually makes it above threshold on the 11 foot antenna. This then is the type of service the 4300 and other PLL type demodulator receivers was intended for; where the antenna plus LNA noise temperature 'equation' simply does not produce enough signal to drive the receiver into full 'quieting' (above FM threshold).



ICM 4300 RECEIVER features six audio sub-carrier selections on the front panel plus 12 channel selector for video. Fine tune control allows precise tuning for 'best' picture although AFC switch [back panel] does it for you automatically.

Our particular 4300 is not equipped with the new 'divide by 2' demodulator circuit which we expect to take the industry by storm in the next few months. But, as Royden points out, "because of the modular approach to construction when the divide by two system is ready for shipment" and is then being included in all regular 4300s being shipped "a user of the present 4300 (4200) can order out a replacement module for someplace in the \$100 to \$125 region".

In spite of the fact that our 4300 does not 'divide by two' we judge the pictures to be the best we have witnessed on a PLL demodulator. In truth, not all of the 4300 units we saw operating at the ICM plant in Oklahoma City looked this good. Back to that old 'no-two-alike' problem created by those microwave parts suppliers! The 4300 receiver in the 3.7 to 4.2 GHz region, down converts ala Shuch into the 1200 MHz region and then further down converts to the 70 MHz region. The PLL demodulator runs at the 70 MHz frequency in our unit.

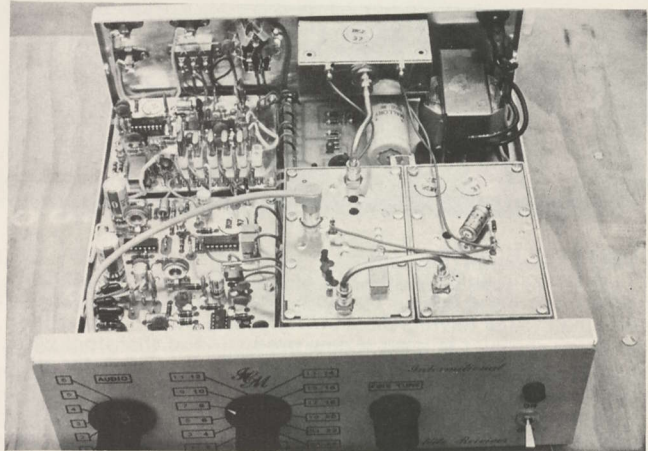
4300 units are equipped with up to six channels of sub-carrier audio with a front panel switch. Because ICM is in the crystal business, these sub-carrier oscillator/detectors are crystal controlled and you can of course 'crystal up' with crystals from ICM. We filled ours up from 5.5 up through 7.5 and then Royden threw in a simple two-capacitor and slug tuned form in the sixth socket. This allows us to pop off the lid and with an appropriate (although hard to find and not common!) plastic tuning tool diddle with the tuning core slug in the form and tune in any other really oddball sub-carrier frequencies.

Royden mentioned while we were in the states that SHOWTIME had, during September, been having some real 'problems' holding the integrity of their 6.8 MHz sub-carrier. It seems that rather than staying on 6.8 they have been wandering about by 100 kHz or more. Shame on RCA for being so sloppy at the Vernon Valley uplink! That's where the tuneable position in the crystal series makes good sense; when RCA gets off (as the recent SHOWTIME experience indicates will happen) you can switch to the appropriate position and dial it up with a tuning tool. We found several instances where (on Westar) being able to tune off the standard sub-carrier frequencies was a handy thing to have available. There is some talk at ICM of bringing this 'tuneable sub-carrier detector' out to the front or at least rear panel and we urge that be done since popping the lid for tuning is not all that handy.

Audio detection on the 4300 is excellent and the quality is there. There are twin output jacks for 'stereo' outputs for those rare bird channels where sub-carrier stereo is being transmitted. You'd have to feed into a stereo audio system of course with this to get the full impact of twin-channels of TV sound but ICM is ready if it does become a 'big' thing.

Video operation of the 4300 is quite positive but takes a little getting used to. On the rear panel is a switch marked 'AFC/on-off'. AFC is of course automatic frequency control. When you dial through the 24 channels with AFC on the picture first looks 'cruddy' as you land on a channel; then the

AFC takes over and it clears up. Determining in the alignment process where the AFC will 'pull' the VCO to, for best looking picture, **may not agree with your eye however** as we found. The 'fine tuning control' still works in the AFC mode and we found that after the AFC has done its part you typically still want to twist a bit on the 'fine tuning' control to get the best balance between color and sparklies. Without the AFC control in the 'on' position the picture requires substantial manual 'fine tuning' each time you change transponders.



MODULAR APPROACH started with 4200 series receivers is carried through with 4300 family. Microwave frequency range units are 'bottled up' on right; video and audio on left in more open-board construction.

Output of the receiver is baseband video and baseband audio. This you connect to a modulator or loop through a BETA or VHS tape machine using that modulator. We checked the output on a color bar (stair step) pattern off of the bird and were quite impressed that the 4300 was not doing nasty things to the video processing.

NOW - how good does the picture look? Well, there is an area where when the picture is from 1 to 3 dB below threshold where saturated colors (yellows and reds primarily) will create quite a hiss and buzz in the audio line. When some creative map maker puts a map of Iran and Iraq on the screen and suppers it with blue or red the audio buzz will almost drown out the regular audio. Fortunately for most of us creative map makers are not very prolific and that kind of video is not transmitted very often. Again, this is a fairly narrow 'window' in the -1 to -3 dB region reference threshold. There is a sudden and dramatic improvement in this condition when the picture level gets better than -1 dB reference threshold; all of the nasty sounds that occur under the saturated color condition mentioned disappear and by the time you get to threshold the picture quality is very good.

But not perfect. Like any PLL demodulator we have seen to date there is a tendency for sharply defined color edges (strong yellows or reds in vertical lines against less powerful colors) to wiggle and tear slightly to the right. That's the main and primary difference one sees between a \$995 receiver like the 4300 and a \$3500 Microdyne for example.

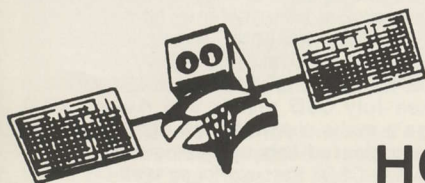
However - in the total honesty department the \$995 4300 (and others like it) do have an advantage over the \$3500 receivers when it comes to below threshold signals. If we assume that a signal into the 4300 that is below threshold by a dB or two or three will also be below threshold on say a Microdyne receiver, the fact is that the picture on the 4300 will look better (in this 'below threshold' condition) than it will on the Microdyne. This is because the PLL's real strength as a demodulator is when the 'going gets rough' and when the input is below threshold. Stuck as we are at the moment with a fixed amount of antenna gain with the 11 foot ADM in use on Provo, our expensive Microdyne receiver simply sits on the shelf not in use since this below-threshold condition makes its picture look far worse than the 4300 looks. The sparklie level on the Microdyne is worse by a large measure than on our 4300; although (again in total honesty) the color purity on the Microdyne is superior.



REMOTE CONTROL box is actually a small, hand held unit. It requires a three wire connection to the receiver [jack on back panel of receiver] and allows you to change channels and fine tune from distant location.

In summary, we like our 4300. It is a very good performing receiver. It is not perfect, but then if it were the ultimate do-everything-best receiver ICM would have to stop making crystals and convert fully to TVRO receivers to keep up with the demand. For now it represents a good bargain in home or private terminal receivers for the buyer who wants good performance at an economical price. We especially like the plug-in remote control option which allows you to run a simple three wire cable anyplace on premises and then 'jack in' the hand held remote unit to change channels from any room in the house. When we finally get moved into our 'Annex' quarters late this year there will be a jack in each room and we'll use this function with great pleasure I am sure.

The 4300 sells for \$995 in its basic form; you add a tad to get the optional remote control box and additional sub-carrier detector crystals also cost you a few bucks more. ICM is located at 10 North Lee, Oklahoma City, Oklahoma 73102 (405-236-3741).



**SBOC
'80
HOUSTON**

HOME SATELLITE TELEVISION SYSTEM

ANNOUNCES OUR
PATHFINDER ANTENNA SYSTEM

DEALERS, NOW YOU CAN OFFER YOUR CUSTOMERS THE BEST! TRULY THE MOST RELIABLE ROTATABLE TVRO SYSTEM, ALLOWING FINGERTIP CONTROL FROM THE COMFORT OF THE HOME. SELECTING ANY ONE OF ELEVEN SATELLITES WITH A TOUCH OF A BUTTON. COMPLETE WITH L.E.D. READOUT OF EACH SATELLITE AS THE DISH SPANS THE SATELLITE SPECTRUM. OUR PATHFINDER IS A MUST FOR THE PRECISE SELECTION OF EACH SATELLITE YOU CHOOSE TO VIEW. ELEMENATES GUESSING-A MUST FOR THE TVRO DEALER ALLOWING PERFECTION, RELIABILITY AND TOUCH OF CLASS FOR YOUR CUSTOMERS.

WRITE OR PHONE FOR PRICE AND AVAILABILITY.

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Division of Rieco TV Service, Inc.

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TULSA, OKLAHOMA 74145

(918) 664-4466



NEED PARTS...
Sat-tec's Got 'em!



SPECIFICATIONS:

Signal input: 70 MHz at -20dbm (22mV)

AFC lock range: greater than 5 MHz

Sound subcarriers: 6.2 MHz and 6.8

MHz fully independent

Video level out: std. 1 volt p-p

Audio level out: 1 volt p-p

Power requirements: 15VDC @ 200 ma

Demodulator: NE564 PLL IC

Tuning voltage out: 2 to 13.5 volts

Tuning voltage in: 0 to 15 volts max.

70 MHz DEMODULATOR CARD

The Sat-tec D-1 demodulator is the last block in a TVRO system, it is where the 70 MHz IF signal is converted to video and audio. The D-1 contains a PLL demodulator, video processor (CCIR de-emphasis, 4 MHz low pass filtering and 30 Hz clamp), dual sound sub-carrier demod and AFC circuitry. The power requirement is small, 15VDC @ 200ma., signal input is -20dbm @ 70 MHz. AFC will enable the user to lock most any VTO L.O. with no problem whatsoever. Video and audio outputs are a standard 1 volt p-p suitable for driving any monitor, VTR, or modulator.

D-1 Demodulator Kit \$99.95
D-1 Demodulator PC board only \$49.95

Part Number	Description	Price Each
Avantek GPD-1002	1GHz, 12 db gain TO-8 can amplifier, 15VDC	\$45.00
Watkins-Johnson V802	2.5-3.7GHz VTO, lower noise than Avantek types	120.00
Watkins-Johnson V705	600-1000MHz VTO, lower noise than Avantek	120.00
Signetics NE564	PLL selected to operate at 70MHz	7.50
Van-L DBM-500	4GHz mixer, SMA connectors	85.00
Amperex ATF-417	1GHz, 25db gain hybrid amplifier, 20-24VDC	19.00
Motorola MWA-110	400MHz, 14db gain, -2.5dbm	9.00
Motorola MWA-120	400MHz, 14db gain, +8dbm	9.75
Motorola MWA-220	600MHz, 10db gain, +10.5dbm	12.40
Motorola MWA-230	600MHz, 10db gain, +18.5dbm	13.50
Motorola MWA-310	1GHz, 8db gain, +3.5dbm	12.40
Motorola MWA-320	1GHz, 8db gain, +11.5dbm	13.50
Motorola BFR-90	3GHz F _T NPN transistor, 15db gain @ 1.2GHz	2.50
Motorola MRF-901	3GHz F _T NPN like BFR-90 but 2 emitter leads	2.75
Regulators: 7800 Series	5V, 8V, 12V, 15V, 1A TO-220	1.50
Regulators: 7900 Series	-5V, -8V, -12V, -15V, 1A TO-220	1.75
IF Transformer	10.7MHz IF can be padded to 6.2 or 6.8MHz	1.25
Tuning capacitor	10pf multi-turn for filters, PLL, etc.	2.00
Coil form + can set	Nice coil form set for filters, good to 120MHz	9.00



Sat-tec Systems; Box 10101
Rochester, NY 14610; (716)381-7265



15 DAY MONEY BACK GUARANTEE
If you are not completely satisfied, return the product within 15 days for a full refund. No questions asked.

AVCOM-

SETTING THE PACE
OTHERS FOLLOW
IN TECHNOLOGY!

NOW in full production, AVCOM's COM-3 and COM-3R 24 channel satellite video receivers! The 'hit' of San Jose because they combine excellent styling with the superb extended threshold performance that made our innovative PSR-3 receiver series the standard of comparison for the entire industry.

COM-3 features 24 channel switch-tuning; **COM-3R** gives the user remote control of the switch-tuning. BOTH have the best low-signal-level extended threshold performance in the industry today with a unique discriminator circuit that makes PLL equipped receivers 'pale' by comparison.

AVCOM of Virginia, Inc. • (804)320-4439
10139 Apache Rd., Richmond, VA 23235

TVRO CABLE PACKAGES!

Now available - special RG-217 low-loss cable assemblies with fittings installed and flexible pigtailed; ready to plug in and go! 217 cable is the ideal TVRO cable, low loss yet flexible. Our special connectors are ideal for quick connect-disconnect too!

#1]80' 217 + 3 foot pigtail for LNA/rotation, all connectors. **\$118 plus UPS.**

#2]40' 217 'extender' with quick connect barrel connector. **\$59 plus UPS.**

PLUS - the Cadillac of LNAs from AMPLICA! Each LNA has factory check-out data sheet showing **exact** specs (some LNAs intended for consumer use are 'bulk rated' so you are not sure what you are getting). Quantity pricing on LNAs and 217 cable assemblies available - inquire!

AVCOM of Virginia, Inc. • (804)320-4439
10139 Apache Rd., Richmond, VA 23235

GENUINE

HOWARD TERMINAL
PC CARDS

Bob Coleman and Tay Howard are now producing six PC cards which make duplication of the Howard Terminal (latest version) a snap!

- (A) Dual Conversion (4 GHz to 70 MHz) - \$25.00
- (B) 70 MHz IF and Filter - \$25.00
- (C) Howard Demodulator - \$40.00
- (D) Dual (2 channel) Audio - \$25.00
- (E) Single Channel Audio - \$15.00
- (F) AFC and Metering - \$15.00

These field proven and tested high quality boards are available as a five-board-package for \$99 package price (you receive A, B, C, E and F above). Included is complete documentation for construction and a list of parts stocking distributors.

Order from: Robert M. Coleman, Rte. 3, Box 58-A
Travelers Rest, S.C. 29690

**BOB COOPER
INVITES YOU TO
SBOC '80
HOUSTON!**

WHEAT AND CHAFF

This letter is to suggest what we feel is desperately needed for the satellite industry. We feel an independent

**PROGRAMMING
CORRESPONDENCE**

testing and evaluation agency that would publish test data results on the products available to the industry would be invaluable. Not only the product quality but the ability of the manufacturers to deliver and their willingness (and ability) to back their products should be included.

We have found that you cannot depend upon the manufacturer's claims because they are naturally biased. Further, few of the firms buying hardware are in a position to purchase **every** product that comes on the market claiming better results or cheaper prices. However, we all desire to provide our customers with the best systems available at a price they can afford. To accomplish this it is necessary to keep abreast of the rapidly changing technological advancements. We do not intend to merely rely on the tried and the proven. But to keep abreast of the art, and to make the right decisions, much more information is needed. We feel a group that would do this should be jointly funded by the manufacturers and dealers. Our company would welcome paying our fair share, as a dealer, to obtain the information that would allow us to make better choices. Hopefully you can see this need and find the time to play an instrumental role in the formation of such an agency.

Name withheld on request
(TVRO dealer in) Alaska

This is a real, stinker, of a problem. We totally agree with you that lots of poorly performing gear is being shipped. Some of it is badly designed, other is reasonably well designed but is poorly aligned or poorly finished because of the tremendous pressures that exist to get stuff shipped.

We recently told several would be advertisers that we could not accept their advertisements for new products because they were not ready to ship. That made them mad at us but we think that ads that suggest gear is ready to ship or in production, when it is not, are mis-leading and when we know this to be the case we have simply decided to not lend credence to the product. NOW - if a product being advertised plainly says that it is under development or 'is coming soon' (such as Parafame's LED remote control that says 'Available Soon') we feel that is clear enough and nobody should be misled.

So how do we know when gear is really ready? That's an even tougher problem. The would-be advertiser naturally professes that it is. We toyed with requiring each supplier to ship us a unit here at CSD for evaluation before we would accept advertising but canned that as impractical. We still encourage suppliers to do this as soon as they can spare a unit because we feel that our appraisal [in print] may help them sell a unit or two. Of course it could go the other way or we could be plain sloppy as we were with the initial Sat-Tec R2 receiver we got. It was our fault that we didn't take the time to check the video response on it (see July CSD review and August CSD addendum) and we won't make that mistake again. On the other hand, John Ramsey cleared this up with a magnificent attachment (see September CSD) that works so well on every

receiver we have that we have encouraged John to make the Video Low Pass Filter Amplifier available as a separate receiver attachment to everyone. None the less early readers who read the initial review in July thought we were off base (we were) when we said it was such a neat receiver. It is - now - with the VLPFA attachment. But we should have caught the distorted video passband in the initial unit. For those who are still wondering how we overlooked this initially the answer is simple enough. We only used the R2 on domestic reception long enough to verify the sensitivity and the to-the-eye picture quality. After that all of the extensive use was on Molniya which every reader knows has so much built-in distortion that you can't tell whether the garbage is bird originated or receiver caused!

We'll make these suggestions. First we pledge to be much more careful with our own reviews in the future. We keep units for review and we'll update our initial report with later observations; both positive and negative. Next we suggest that every buyer who has any type of problem write us and tell us about it. We'll print your letter, just as you write it, but we'll extend to the company you are zinging the right of equal time / space for a reply. To qualify for print however we'll have to have your permission to print your full name and address as it is not fair to zing somebody and then hide behind a 'name withheld' label. Second we'll keep an open mind about all of this and await additional suggestions from readers as to how we can help you be sure that what you read is accurate. YES - we'll see that products not yet ready for delivery are clearly so labeled in the advertisements.

As for getting all of the suppliers to agree to funding a testing lab, well, we are dismayed that many of the bigger name suppliers have not yet joined SPACE! Can you imagine how short sighted they must be to not support SPACE when it was SPACE and SPACE alone that got 'manufacturing, distributing and selling' TVRO terminals out of the initial draft of HR 7747? If you want to put some pressure on the suppliers, next time you talk to one ask them if they have yet joined SPACE. Maybe if they haven't you should take your business elsewhere....

GHOSTS OF THE PAST

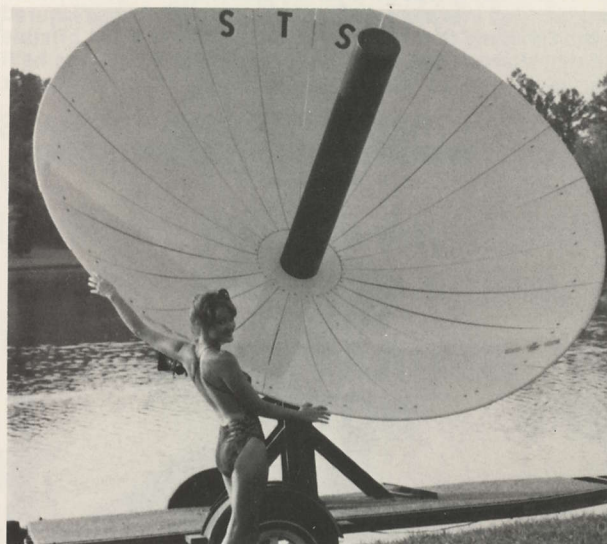
The antenna shown here just might be familiar to you. We have just finished putting it onto a permanent foundation just outside of the Rogers Telecommunications (Rogers Cable TV) facility near Toronto. I don't know how or when or whether it will ever be used but it is ready to go none the less. At the moment it's potential use for a Canadian cable group's uplinking is all bound up in the Canadian "satpolitiks".

I. Switzer, P. Eng.
Switzer Engineer Services Limited
Mississauga, Ontario
Canada



Sruki's photo is of the infamous 11 meter terminal which Coop and others wrestled from near Detroit to Oklahoma in the summer of 1978 to stage the first-ever private uplink system to

POINTING THE WAY



STS OF MISSOURI is the leading supplier of high quality, good-looking earth terminals built to sell at every level of the private-home terminal marketplace. Our antenna systems are designed to compliment rather than detract from customer grounds!

STS OF MISSOURI is actively seeking dealers to work with us in bringing high quality satellite television reception to all areas of North America. Our standard 10 foot fiberbolic is one of the best performing satellite antenna systems in the world today!

IF YOU are seriously interested in becoming a full dealer for satellite TV systems in your area, talk with us. Find out why STS of Missouri home satellite system packages take the hassle out of selling and installation; how a really top manufacturer can handle the **complete packaging** of your system leaving you free to concentrate on package sales and installation. STS of Missouri offers 10 and 13 foot antennas, a complete system package as well as component parts. And we have the best dealer support program in the industry today!

GET THE FULL story from the leaders. Contact STS of Missouri today using our dealer-hot line 800 telephone number shown below.

STS OF MISSOURI

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Call toll free 1-800-325-0761

televised the proceedings of the CATA cable TV show continent wide via SATCOM. When we had this terminal in Oklahoma, we put it together and erected it by hand (!); see June 1980 CSD. While taking it down after the uplink event a bolt sheared and it tumbled into a tangled heap. Fortunately it was insured but the company that repaired it back to the present pristine condition charged \$25,000 or so to restore it! Coop vows he'll never mess around with hand assembling 11 meter uplink terminals again!

BIRD OPERATIONAL NOTES

APPEARANCE of VEU service on WESTAR 1, transponder 5 starting September 30th on to this otherwise-uninteresting satellite (PBS aside), has started new debate among programmers as to importance of being on particular satellites (such as COMSTAR D2 or SATCOM FI). VEU is feed for **pay TV stations** in mid-west, starts programming weekdays 8 PM eastern and runs about six hours per night; expanded on weekends. Most movies shown fall between those in theater release cycle and those that will (3 to 6 months later) appear on normal SATCOM FI cable service premium channels. Typical service is three movies per night with some 'filler' shorts.

Heavy satellite loading during fall period, especially on WESTAR birds, has many independent TV broadcasters very upset. WESTAR rates for carrying sporting events back to home markets are 40-50% lower than comparable 'land line' rates. Shortage of transponders has resulted in much shuffling of normal assignments complicated at press time by weekday sporting events associated with World Series and playoffs.

ORTAG, a clandestine rocket design group with ties to West Germany, is back in the news. Group attempted to create privately owned rocket system which they said would be available to anyone wishing satellites launched (for a fee) and had used Zaire to test rocket engines. Both US and Russia have kept up political pressures on countries with direct and indirect support for ORTAG so it went underground. Report in **Satellite Week** now tells us ORTAG is alive and well and will shortly conduct additional tests from an undisclosed location; expecting to become a viable 'third/fourth choice' (after Russia/US/France) for satellite launching services.

CANADIAN satellite situation may be reaching proverbial straw upon a camel's back. Now Winnipeg Holiday Inn has satellite service and cable operators in Canada, still precluded from using US satellites, are plainly ready to bite bullet and jump into US satellite service. Canadian licensing of cable systems there precludes such cable use of US satellite signals but Canadian cable operators say they cannot afford to wait much longer for official government decision as groups such as Holiday Inn and small apartment complexes continue to install 'private' terminals at fast growing rate.

AMERICAN EXPRESS Christmas catalog offers \$12,500 'private home terminal' package capable of being charged on card and paid for over ten equal installments. Package is for 3 meter dish, 24 channel receiver, 120 degree LNA, installation including computer or on-site interference study. Seller is Michigan's Third Wave Communications firm.

PBS report of direct broadcasting satellites (DBS) concludes "We believe it will be several years before there is a DBS system operating in the United States". They are probably correct; if one identifies a DBS system as being a system **designed for home use**.

GROWTH of concept to install satellite TV terminals in condominiums and apartment houses is exploding. In Miami area a group funded by large private dollars is installing 6 meter antennas and first class equipment to delivery four or five satellite channels in 'mini-cable' packages. Others are active in Detroit, Chicago and Dallas. Most of the systems being installed offer ESPN, Nickelodeon, an indie or two and one of the pay services. Most would like to offer HBO because of its generic identification but HBO has been reluctant to sign agreements with many because of fear of offending local cable people. SHOWTIME is usual second choice, The Movie Channel third.

TUNING in the Ali/Holmes fight was an interesting challenge for many. Fight was carried on a WESTAR bird (scrambled), ANIK (not scrambled) and COMSTAR D3 (on the Caribbean) bore sight beam which was not useable over much of USA). But best news of all follows.

DON KING, the gigantic fight promoter who brought together Ali and Holmes has advised CSD through his attorney Milt Sherman (32 E. 69th Street, New York, N.Y. 10021; (212)794-2900) that **any** private terminal viewer who tunes in the fights in the future (such as Leonard-Duran New Orleans **November 25th**) may do so without fear of legal action; provided. **PROVIDED** they (1) do **not charge** in ANY way those who watch the service with them, (2) **send a letter** to Milt Sherman advising him they are doing so (receiving fight and not charging), (3) **agree** to send a 'donation' (no size specified) to the U.S. Olympic Committee. However - anyone who attempts to make money on the fight by pretending to be a 'private terminal viewer' is just asking for some nastiness. Write your letter (as we urged you to do to CBN in our September CSD) and keep your nose clean!

TELEVISION LAND is **Growing** article appearing September 28th issue of Sunday **PARADE** supplement (to many national newspapers) brought heaviest response to **STT/CSD** of any publicity to date. We thought **POPULAR SCIENCE** (March 1980 issue) 'piece' was spectacular when 3,200 pieces of mail showed up in five weeks. **PARADE** drew that many pieces **first week** and as those who tried to telephone CSD between September 28th and about October 15th now know, telephone calls from 7:30 AM to past midnight at 15 second intervals. Author Dick Thompson who attended SPTS '80 San Jose to gather material for piece is **TIME Magazine** staffer; he submitted piece to **TIME** on assignment, they turned it down at high level because (we were told) **TIME** owns substantial chunk of HBO. Thompson then submitted it to **PARADE**. Thompson now working on new handbook for laymen describing satellite TV; hopes to sell it through firm such as Bantam.

CNN donated TVRO terminal to Congress backfired. Dish could not go on lawn where it should go; second location produced much terrestrial interference. CNN hired COMSAT (!) to work out problem. CNN wants terminal in Congress view so members can tune in CNN service in their offices on internal cable TV system.

ONE fallout of uncertain future of network programs this fall has been continued spurt in sale of home VCR units; for first 38 weeks of this year VCR units imported into USA outpaced similar record marks in 1979. Machines continue in 'tight' supply nationwide with big Christmas buying spree coming.

MORE insight into plans of SHOWTIME to offer no-fee basic cable service. SHOWTIME parent VIACOM (producer of many syndicated TV shows) looking at packaging old sitcom's with new series for service which if it flies will probably land on transponder 17 of FI displacing WOR to COMSTAR D2; sometime towards end of first quarter of 1981.

WARNER AMEX has acquired rights to COMSTAR D2 transponder 11 (vertical) from a firm called Rainbow Communications. Warner already 'owns' three (1, 5, 11) on SATCOM FI. This is likely to be home for new 'pop music service' channel rumored by Warner if it comes to life.

KLM's

SKY EYE I SATELLITE TV RECEIVER

Our "no compromise" design ends the trade-offs between convenience and performance!

The modular Receiver Unit, in a weather-proof case, mounts at or near the dish, close to the LNA.

The compact remote "Control Center" mounts anywhere you need it and features continuous channel and audio tuning, and polarity switching for your motorized feed.



The KLM SKY EYE I Control Center (shown 3/4 size)

The KLM SKY EYE I RECEIVER package delivers these outstanding features:

Control Center

- Full frequency agile (continuous tuning)
- Continuous audio tuning 5.8-7.4 MHz
- Polarity control switch
- Separate regulated power supplies to LNA and RCVR
- Uses standard RG-59 for R.F.

Receiver Unit

- Single conversion, image rejection mixer (greater linearity and video response than any PLL)
- Built in D.C. block
- Modular construction
- Weather-proof enclosure

PRICE: \$1295 (dealer inquiries invited)

For complete information call or write:

KLM Electronics, Inc. "The innovators in communications equipment since 1970"

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Sat-tec

THE LEADER IN LOW COST TVRO

Introducing the R2 Satellite Receiver

A TV Satellite Receiver with all the features you need, at a price you can afford.

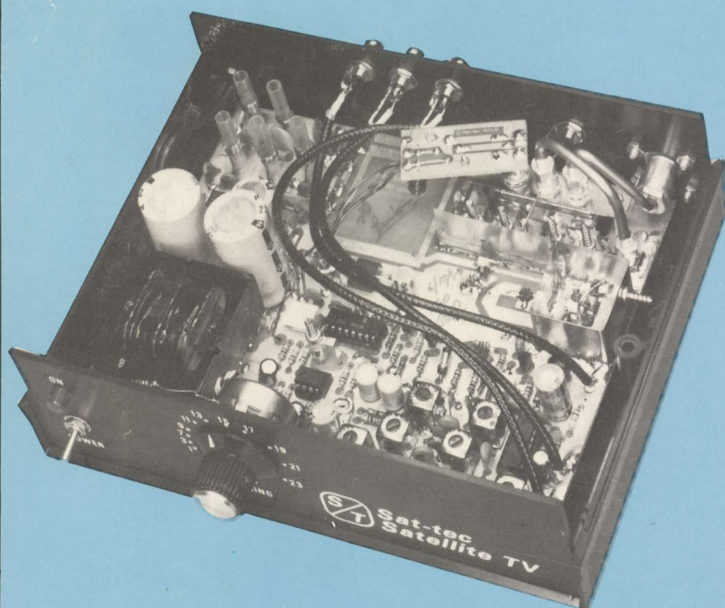


The Sat-tec R2 receiver is a versatile, consumer oriented unit designed for volume production. Easy operation and a clear, simple format makes the R2 idea for any application where non-technical users are involved. Fully frequency agile, the R2 may be used on 12 or 24 transponder birds, and since the tuning is continuous, foreign satellites such as Intelsat and Molniya can be received. A high performance AFC keeps the tuning accurate and sharp, fine tuning is not necessary. Standard one-volt P-P outputs for both audio subcarriers as well as video interface easily to any VTR or use the optional BC-1 modulator for direct TV set hook-up.

For a quality, low cost TVRO system, the Sat-tec R2 receiver can't be beat!

SPECIFICATIONS

- Frequency Range:** 3.5 - 4.5 GHz
Noise Figure: 12 dB, a 120° K 50 dB LNA and 10' dish provides good quality reception for most of USA.
Audio Subcarriers: 6.2 and 6.8 MHz standard, others available.
LNA Power: 15 volt at 150 Ma LNA Supply built-in.
Power Required: 110 VAC at 15 watts 50/60 Hz, 220 volt available.
Size: 8x6x3 inches, 3 lbs.
Price: \$995.00, completely wired and aligned; one year warranty.
Optional: BC-1 RF Modulator Kit, tuneable channels 3-6 with sound....\$24.95.



Sat-tec Systems

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